Bhoochetana

Mission to Boost Productivity of Rainfed Agriculture through Science-led Interventions in Karnataka

Department of Agriculture
Government of Karnataka

ICRISAT
Science with a human face

International Crops Research Institute
for the Semi-Arid Tropics

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Watershed Development Department (WDD

Universities of Agricultural Sciences, Bengaluru

Universities of Agricultural Sciences, Raichuru

Universities of Agricultural Sciences, Dharwad

Department of Economic and Statistics

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

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Government of Karnataka

Message

Karnataka State Department of Agriculture has been implementing Bhoochetana since 2009–10 in co-ordination with ICRISAT, Watershed Development Department and three State Agriculture Universities as consortium partners. Bhoochetana is a science based, novel programme with a new dimension. This programme has adopted the principle of convergence in various components under different agricultural development schemes for achieving the project goal of 20% enhancement in productivity of dryland crops.

This special initiative of Karnataka has achieved a great success and drawn attention of Government of India and also various other States. The programme was started during 2009–10 in six districts covering 2.25 lakh hectares benefiting 2 lakh farmers. The programme was extended to 15 lakh hectares in 16 districts benefiting 8.5 lakh farmers during 2010–11. This was further extended to all 30 districts covering an area of 31 lakh hectares during 2011–12 benefiting 22 lakh farmers. With the great success achieved during the past three years, the programme implementation is planned to cover an area of 50 lakh hectares reaching 45 lakh farmers during 2012–13. The concept of Bhoochetana is also extended to irrigated paddy and sugarcane covering an area of 5 lakh hectares.

I wish the farmers would take benefits under Bhoochetana for enhancing yield levels and also production. Further, farmers can enhance their net income by adopting post-harvest processing and value addition to the enhanced produce. I also wish farmers to achieve higher productivity and production with favourable seaosonal conditions during the ensuing year.

(Umesh V Katti)
Minister for Agriculture
Government of Karnataka

Date: 16-04-2012

ICRISAT

Message

There are 7 billion people in the world today, with an estimated 925 million, or 13.1% people hungry. The world's population is projected to reach more than 9 billion in 2050, which will require a formidable 70% increase in food production needing 30% more water and 50% more energy by the middle of the century. We will face this formidable challenge with shrinking land and increasingly scarce energy and water resources, and when climate change will start to have serious environmental impacts on the planet, flooding coastal plains, spreading deserts and raising temperatures.

Limitless opportunities exist to unlock the vast potential of rainfed agriculture in achieving food security and reducing poverty in developing and emerging economies of the world. Covering 80% of agriculture globally, scientific and technological innovations are needed to improve rainfed agriculture productivity which, currently is oscillating between 1 and 2 t ha^{-1} on farmers' fields, lower by two- to four-folds of achievable potential.

The Government of Karnataka has taken-up an innovative science-led development initiative called Bhoochetana (revival of the land) to harness the potential of rainfed agriculture in the state with the help of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Bhoochetana is a farmer participatory scaling-up approach that adopts the principles of consortium, convergence, capacity building and collective action. It links knowledge-generating institutions like State Agricultural Universities (SAUs), National Agricultural Research Systems (NARS) and ICRISAT with knowledge transforming agencies like the Department of Agriculture and the Department of Watershed Development to benefit millions of smallholder farmers in the state. Bhoochetana is technically supported by the ICRISAT-led consortium of SAUs, implemented by the Department of Agriculture along with other partners in the state.

The unique mechanism of scaling-up with comprehensive planning, review and monitoring along with new institutions like Farm Facilitators (FFs) Raitha Samparka Kendras (RSKs) and supporting policies enabled the consortium to cover 3 million hectares of rainfed area in the state during the rainy season of 2011–12. During the 3rd year of this program, in spite of unfavorable rainfall situation, farmers harvested increased crop yields by 21–30% with improved management practices, contributing immensely to the economy of the state. Due to its success, the Bhoochetana program will be covering 5.5 million hectares to include sugarcane and paddy during the rainy season of 2012–13.

The Bhoochetana mission program has demonstrated the power of science to increase agricultural production and productivity in rainfed areas for the farmers by sustaining soil fertility through soil-test-based nutrient management practices along with improved cultivars and soil and water management practices. I wish the Bhoochetana consortium team all the success, and hope that the Bhoochetana program becomes the model of a holistic, science-led development for the benefit of millions of smallholder farmers in the country and towards the fight against hunger and poverty particularly in the semi-arid tropics of the world.

William D Dar

Director General, ICRISAT

Government of Karnataka

Message

Owing to its geographical position, topographic features; Karnataka State has become an upper riparian state and as such dependency on rainfed agriculture has become an inevitable option. Although 80% of the cultivable soils are suitable for irrigation, due to inadequate irrigation facilities, 70% of the cultivable area continues to be under rainfed situation. There are huge gaps identified between potential yields and actual farm level yields which could be bridged through large scale adoption of dryland technologies. This could be achieved through concerted efforts for upliftment of dryland farmers.

"Bhoochetana" – a prestigious and special agriculture development programme of the State is being implemented since 2009 to increase the producitivty of rainfed crops.

"Bhoochetana" is a scientific knowledge-based programme implemented in consortium approach with ICRISAT, Watershed Development Department and three State Agriculture Universities as consortium partners. This programme being in implementation for the past three years has shown clear impact of rainfed farming technologies enabling increase in the productivity by 20% to 50%.

I hope the principles and technologies adopted in Bhoochetana may go a long way in benefiting the farmers of the rainfed areas particularly small and marginal farmer.

(Subir Hari Singh)
Additional Chief Secretary &
Development Commissioner

Date: 16-04-2012

Foreword

Karnataka State has made a steady progress in agricultural sector in spite of bottlenecks like - natural calamities and vagaries of monsoon. Karnataka has been a role model to other States, in implementing some of the unique, innovative agricultural development programmes in addition to other programmes.

An important feature of the State is that 70% of the total cultivated area is under dryland agriculture with indefinite and inadequate rainfall situation.

In-spite of this drawback, the State's total food production has increased from 35 lakh tons during 1950's to about 110–120 lakh tons at present. The State has an all time record food production of 139.6 lakh tons during 2010–11. This can mainly be attributed to increased yields achieved in dryland areas in addition to increase in yields of irrigated areas.

Bhoochetana, a novel innovative programme initiated during 2009–10 by Karnataka State in order to increase yield levels of dryland crops. The background for the initiation of the programme is that the demonstrations conducted by the State Agricultural Universities and ICRISAT, Hyderabad, have proved a possibility to increase the yield levels dryland crops through adoption of good dryland farming technologies.

The main strategies adopted under Bhoochetana include soil and water conservation techniques, use of micro-nutrients in addition to major nutrients based on soil test results and also use of good quality seeds. It is an integrated approach of working in co-ordination with ICRISAT, Hyderabad, Watershed Development Department and State Agricultural Universities. Implementation of Bhoochetana programme has shown an increase in yield levels of dryland crops varying from 32–42% during 2009–10, 25–50% during 2010–11 and 21–43% during 2011–12, clearly indicating the success of the scheme in the State.

The progress achieved by the State of Karnataka under Bhoochetana programme has received wide appreciation from the Government of India and also drawn the attention of other States.

I, strongly believe that the Bhoochetana programme technologies will be more useful to the farmers of dryland areas, specially to the small and marginal farmers of the State in the ensuing years.

(Dr. Baburao Mudbi IAS)
Secretary, Agriculture Department
Government of Karnataka

Date: 16-04-2012

Preface

Role and contribution of rainfed areas in food production has been quite significant. Eighty per cent of the cultivable area in the world and population is dependent on rainfed agriculture. Major share of food production ie., about 60% comes from rainfed agriculture. Area under rainfed agriculture in India is 85 million ha. contributing to 44% National food production. Similar situation more or less exists in Karnataka. Out of total cultivated area of 123.85 lakh ha., about 70% of the area is rainfed.

Major rainfed crops of the State are jowar, ragi, maize, minor millets, groundnut, sunflower, soybean, *tur*, green gram, black gram, Bengal gram, and field bean etc. It has been observed that the average yields of these crops by and large in the State are less than the national average and also averages of other States. Further a wide gap exists in actual yield levels in the farmer's field and yields of field level demonstrations.

There is an opportunity to enhance yield levels in the fields of farmers by two to three folds through adoption of suitable improved dryland technologies for various crops. Based on the research findings of ICRISAT, Hyderabad, and demonstrations conducted under Sujala Watershed Programme; a set of dryland technologies have been identified by ICRISAT, Hyderabad for increasing yields to an extent of minimum 20%. Encouraged by this, and also with a view to enable farmers to get better yields in their fields, the Government of Karnataka initiated an novel scheme called **Bhoochetana** during 2009–10.

The main objective of the scheme is to increase yield level of various dryland crops to an extent of 20% by adoption of science based dryland farming technologies and efficient utilization of the natural resources. Suitable guidelines and technologies have been formulated to achieve desired objective of the scheme and the same have been included in the action plan of Bhoochetana.

The five important implementation strategies of Bhoochetana programme are; i) recommendation of nutrients based on the soil test results and also to educate the farmers about the nutrient deficiencies in their fields ii) timely supply of agricultural inputs to the farmers in cluster villages under subsidy which are supportive for adoption of the technology iii) use of wall writings, announcements, village meetings, trainings, field days, street dramas, articles etc. to provide publicity of the scheme as well as for educating farmers about the technologies iv) use of farmer facilitators at village level for transfer of technology v) training programmes at village level for the development of skills and efficiency among farmers.

Based on the success achieved in selected six districts (2.25 lakh ha) during 2009–10, the scheme was extended to another ten districts (12 lakh ha.) during 2010–11 and further, extended to all the 30 districts (31 lakh ha) of the State during 2011–12.

During 2009–10, 2010–11 and 2011–12, about 2 lakh, 8.5 lakh and 22 lakh farmers respectively were benefited from the scheme. The success of the scheme is well evident from the increase in average yields of 30–40% during 2009, 25–50% during 2010–11 and 21–43% during 2011–12. Karnataka State received a prestigious “Krishi Karman Award” from the Government of India and “Leadership Award” from Agriculture Today during the year 2010–11 for which contribution of Bhoochetana was quite significant.

I, strongly believe that this booklet containing progress achieved under Bhoochetana scheme during the past three years, programmes of 2012–13, action plan and guidelines for the year 2012–13 will definitely benefit the policy makers, programme implementation staff at districts, *taluks* and field level.

(Dr. K. V. Sarvesh)
Director of Agriculture and
Commissioner for Agriculture I/C

Date: 16-04-2012

Bhoochetana

Mission to Boost Productivity of Rainfed Agriculture through Science-led Interventions in Karnataka

Introduction

Figure 1. Rain starved drylands and farmer.

Globally rainfed areas are hot-spots of poverty, malnutrition and degradation of natural resources (Fig.1). In India, out of 142 million ha of arable lands, 60% (85.2 million ha) is rainfed. Karnataka has the second largest area (5 million ha) under rainfed agriculture after Rajasthan in the country. Crop yields in dryland areas are 1–1.5 t ha^{-1} which are lower by two to five folds of the achievable potential yield (Fig.2) largely due to low rainwater use efficiency (35 to 45%). Potential of dryland agriculture could be unlocked using available scientific technologies for improving rural livelihoods through sustainable intensification of rainfed areas.

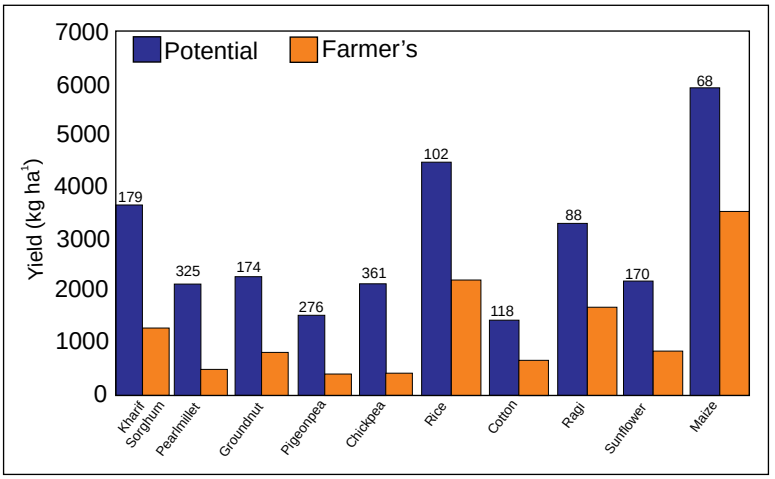

Figure 2. Current farmers' yields are lower by two to three folds than achievable potential.

Background

Sujala-ICRISAT Experiences

An innovative approach of Sujala-ICRISAT, a process based science-led development initiative in six districts of Karnataka (Chikkaballapur, Chitradurga, Dharward, Haveri,

Kolar, and Tumkur) during 2005 to 2008, showed increased crop productivity on 3700 ha by 27 to 58 per cent over the farmers managed plots.

Salient learnings from GoK Sujala-ICRISAT initiative

- Karnataka soils are not only thirsty but are also hungry as 50–90% of the farmers' fields are deficient in sulphur, zinc and boron along with nitrogen and phosphorus (Table 1).
- Knowledge-based entry point activities enhanced the capacity of the farmers and improved their participation (Fig. 3) in the program activities.

Figure 3. Farmers' participatory soil sampling.

Table 1. Diagnostic soil analysis of 11609 samples analyzed by ICRISAT/DoA from farmers' fields in 30 districts of Karnataka

	% deficient fields					
District (No of fields sampled)	OC	Avail. P	Avail. K	Avail. S	Avail. Zn	Avail. B
Chikaballapur District (2257)	78	37	34	80	52	80
Chitradurga District (1489)	76	54	15	86	80	64
Dharwad District (1129)	31	53	1	79	44	39
Haveri District (1532)	55	42	5	85	60	46
Kolar District (2161)	81	31	34	85	32	87
Tumkur District (3041)	77	65	34	92	50	91

- Farmers participatory action research showed increased crop yields upto 345% with sunflower, 230% with *ragi*, 240% with groundnut, 150% maize, 116% soybean and 27% sorghum over farmers' management. During scaling-up initiative, larger number of farmers revealed that crop yields increased up to 58% even during the unfavourable year like 2008 (Table 2).
- Farmers selected improved varieties of *ragi* (MR 1 and LR 5), groundnut (ICGV 91114 and GPBD) along with improved hybrids of maize, sunflower and soybean (JS 9305)) through participatory varietal evaluation and produced increased yields over their varieties.
- The economic benefits because of improved management practices in case of grain crops varied from Rs. 6300 ha^{-1} in case of finger millet (*ragi*) to Rs. 21000 per ha in case of sunflower.

Table 2. Increased crop productivity (kg ha^{-1}) in 6 districts of Karnataka with best-bet practices in selected watersheds during rainy season of 2008.

Crop	Farmers practices (kg ha^{-1})	Best bet practices (kg ha^{-1})	% increase in yield
Ragi	1750	2770	58
Groundnut	1300	1940	49
Maize	4760	6490	36
Soybean	1225	1635	33

Bhoochetana: A Mission Mode Project to Unlock the Potential of Rainfed Agriculture in Karnataka

How it Began

In 2009, a high level committee comprising Additional Chief Secretary cum Development Commissioner, Economic Advisor to Hon. Chief Minister, senior officials from Departments of Agriculture, watersheds, economics and statistics, University of Agricultural Sciences, Bengaluru, Dharwad and Raichur and ICRISAT scientists brainstormed to address the issue of very low (0.5%) agricultural growth rate in Karnataka. ICRISAT presented the vast potential of rainfed agriculture in Karnataka waiting to be harnessed based on the evidence gathered from 3700 farmers' fields through scaling-up phase of Sujala-ICRISAT initiative. The high-level committee invited ICRISAT to develop a strategy proposal for enhancing productivity of raifned crops in Karnataka.

Figure 4. Map of 30 districts in Karnataka.

Goal of the Mission-mode Project

The goal of Bhoochetana is to make a difference in the lives of farmers in the 30 districts of Karnataka (Fig. 4) through increasing average productivity of selected crops by 20% in four years.

Objectives

The overall goal of this mission project is to increase average productivity of selected crops in the selected 24 districts by 20% in four years. The specific objectives are as follows:

1. To identify and scale-up best-bet options (soil, crop and water management) including improved cultivars to enhance productivity by 20% of the selected crops in selected 24 (later extended to 30) districts;
2. To train DoA staff in stratified soil sampling at villages, analysis of macro- and micronutrients, preparation of GIS-based soil maps; and to guide DoA, to establish high quality soil analytical laboratory at Bengaluru and to undertake stratified soil sampling, their analyses and sharing results in nine districts; and
3. To build capacity of the stake holders (farmers and consortium partners) in the sustainable management of natural resources and enhancing productivity in dryland areas.

The Bhoochetana initiative undertaken by the Department of Agriculture, Government of Karnataka is the path-breaking approach for development and inclusive growth through enhanced productivity in dryland agriculture through use of science-based technologies and sustainable use of natural resources.

Consortium Partners

The consortium comprised Karnataka State Department of Agriculture, with its Commissioner and Director as the nodal officers for implementing the project and other partners include:

- Watershed Development Department with its Commissioner as focal person to coordinate activities;
- Universities of Agricultural Sciences (Bengaluru, Raichuru, Dharwad) in the State of Karnataka with their Vice-Chancellors as SCC members supporting technical help from university scientists;
- Community-based Organizations (CBOs) such as Raitha Samparka Kendras (RSKs); and
- International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT) for technical backstopping, facilitation, capacity development, monitoring and evaluation.

Bhoochetana Project Launching and Exhibition at Haveri

The project was launched by the Hon. Chief Minister of Karnataka Sri BS Yeddiurappa on 23rd May 2003 in Haveri (Fig. 5a). An exhibition of Agricultural inputs and implements was organized by DoA, ICRISAT and commercial corporations (Fig. 5b).

Figure 5a. Bhoochetana launching by Hon. Chief minister of Karnataka Mr. B S Yeddyurappa on 23 May 2009 in Haveri.

Figure 5b. Farmers visiting exhibition stalls of ICRISAT on the occasion of Bhoochetana launching ceremony.

Project Planning and Monitoring Mechanism

- State Coordination Committee (SCC) (Fig. 6) chaired by Development Commissioner with members representing Economic Advisor to Hon. Chief Minister, DoA and WDD officers, SAU VCs and ICRISAT project coordinator was constituted to oversee implementation of Bhoochetana.
- The nodal officer took the responsibility to bring together all consortium partners for their inputs in the Mission project.

- Mission mode coordination and implementation at different levels starting with cluster of villages in each *taluk*, linking-up with *taluk* coordination committees (TCCs) and TCCs linking-up with district coordination committees (DCCs) and state coordination committee (SCC).
- Clear roles and responsibilities for each consortium partner for effective implementation.

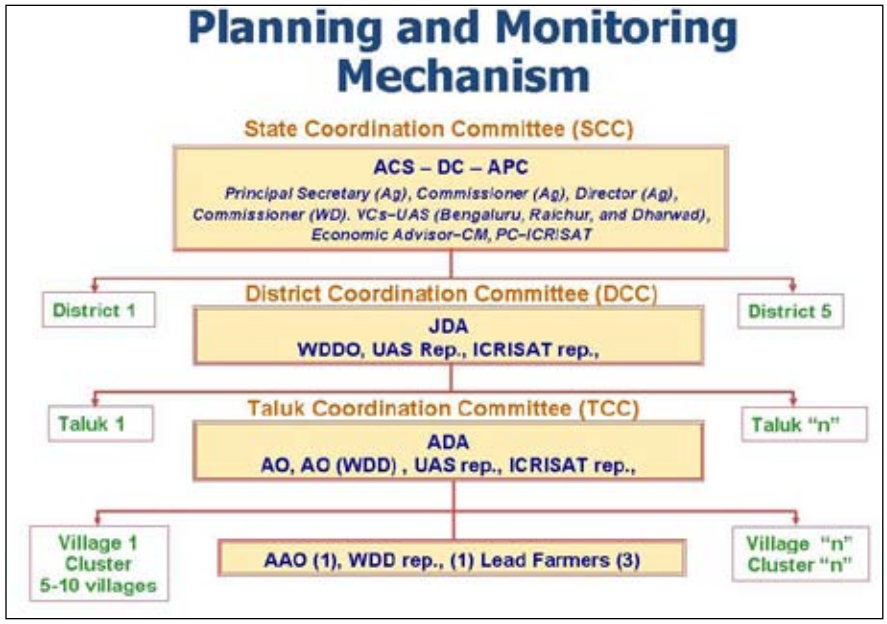

Figure 6. Planning and monitoring mechanism for implementing Bhoochetana mission mode project by DoA, Karnataka, facilitated by ICRISAT.

Project Strategy

Farmers' participatory knowledge-based holistic mission approach for enhancing crop productivity through convergence of different line departments of Government of Karnataka along with State Agricultural Universities (SAUs) with the international institution (ICRISAT) working in the area of dryland agriculture worldwide.

Salient points for the Mission mode:

- The Mission adopted the principle of 4 Cs ie., Consortium, Convergence, Capacity- building and Collective action. The consortium of development agencies such as line departments of state government and Farm Facilitators (FFs) along with academic and research institutions who generate the new technologies and knowledge for improving the livelihoods of the rural poor in dryland area is formed.
- Converge all the schemes of DOA into Bhoochetana.

- Develop capacity of DoA staff to adopt science-led development in the state and build the strong cadre of Farm Facilitators through capacity building with the help of master trainers from SAUs.
- Address the Mission goal through 4 Es ie., Efficiency, Economic gain, Equity and Environment protection, which are the important pillars of the sustainable and inclusive development in the country.
- Ensuring timely supply, availability and access to the necessary vital inputs such as knowledge-based soil nutrient management options, acquiring micro nutrients, availability of good quality seed and other best practices, necessary financial incentive to undertake best-bet options for increasing agricultural productivity through Raitha Samparka Kendras (RSKs).
- Adopt improved best-bet management practices (BBMPs) on large scale and share knowledge through trained Farm Facilitators (FFs) and Lead Farmers.
- Mapping soil nutrient deficiencies in the remaining 24 districts which will be the starting point for scaling up the soil analysis based integrated nutrient management (INM) practices for sustainable growth in dryland areas of Karnataka.
- Demonstrate and popularize other BBMPs such as rainwater management, pest management options and organic matter building practices to support the long-term sustainability and enhanced productivity.
- Establish village seed banks for the crops cultivars by training the farmers to ensure timely supply of seeds at reasonable prices for the farmers.
- Well planned time-bound targets for covering productivity enhancements in 30 districts, soil sampling and nutrient analysis mapping and capacity building of stakeholders during the project period as shown in Table 3.

Table 3. Timeline for execution of activities in Bhoochetana districts.

		% activity coverage in districts		
Activity	Year	**1–6**	**7–15**	**16–30**
Productivity enhancement	2009	25		
	2010	50	33	
	2011	75	66	50
	2012	100	100	100
Nutrient status mapping	2009	100		
	2010		100	
	2011			100
	2012			
Capacity-building	2009	100		
	2010		100	100
	2011			

- Regular monitoring and evaluation mechanism at cluster, *taluk*, district and state levels through videoconferencing. (Fig. 7).
- The Mission has simple principle of accountability and delegation of authority at different levels without diluting the individual accountability to meet the Mission goal collectively.
- Rewarding the best performers ie., the farmers and Mission staff with outstanding performance with appropriate personal recognitions. .

Figure 7. Weekly reviews of the progress in the districts through video conferencing by State level coordination committee (SCC) from Bengaluru.

Appropriate Rainfed Agricultural Technologies

In-situ Soil and Water Conservation Techniques

- **Conservation furrows** laid on a gradient of 0.2 to 0.4% at the time of sowing (Fig. 8a)
- **Cultivation across the slope or contour cultivation** for conserving soil moisture.
- **Broad-bed and furrow (BBF) systems** is laid out on a slope range of 0.4 – 0.8% with an optimum of 0.6% slope. BBF system (Fig. 8b) to facilitate drainage of

Figure 8a. Conservation furrows.

Figure 8b. Broad Bed and Furrow system of cultivation.

excess rainwater as runoff and furrows to act as traffic zone for plough bullocks. On Alfisols, raised beds suit well for groundnut cultivation as beds facilitate good aeration, store more moisture for the roots resulting in good crop growth.

Tropicultor

A multipurpose wheeled tool carrier (Tropicultor), for sowing of seeds, application of fertilizer and interculturing (Fig. 9a & b).

Figure 9a. Applying fertilizer and seed at a time with animal drawn Tropicultor.

Figure 9b. Applying fertilizer and seed at a time with tractor mounted Tropicultor in Kottur watershed, Dharwad.

Integrated Nutrient Management

Taluk-wise soil-test based balanced nutrient practices were taken-up to correct nutrient deficiencies and restore soil fertility to increase water use efficiency and productivity.

Biofertilizers and Biocontrol Agents

- Rhizobium, Azospirillum, Azotobacter add nitrogen to the soil and phosphate-solubilizing bacteria make citrate soluble phosphorous available to crops and also secrete growth promoting substances. Trichoderma viride is a fungus used for seed and soil treatment for suppression of various diseases caused by fungal pathogens through seed and soil (Fig. 10). Vermicomposting (Fig. 11) and organic matter generation (Fig. 12)

Figure10.Trichoderma viride fungal growth and Rhizobium treated seeds.

Figure 11. Adoption of Vermicompost preparation methods by rural women in Bhoochetana project.

Figure 12.Glyricidia planting on field bunds as green manure and reduce soil erosion.

Figure 13. Shaking pigeonpea plants to drop Helicoverpa larvae from the plants.

Figure 14a. Soaked chickpea seed infected with NP virus as feed to Heliothis larvae.

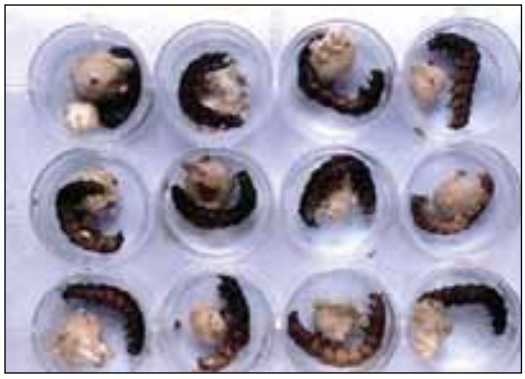

Figure 14b. Dead Helicoverpa larvae by consuming NP Virus infected seed.

Figure 14c. Larval crush centrifused to isolate virus, which is sedimented at the bottonm.

- Cost-effective eco-friendly integrated pest management (IPM) methods like shaking pigeonpea plants at flowering and pod formation (Fig. 13), for *Helicoverpa* sps. on pigeonpea and red hairy caterpillar on groundnut; use of Nuclear Polyhedrosis Virus (NPV) were adopted (Fig. 14a, b & c).
- Village seed banks ensured availability of good quality improved cultivar seed in the village itself as farmers produce the seed for reasonably cheaper price.

Farmers' Preferred Improved Varieties

High-yielding, stress tolerant short-duration varieties of major rainfed crops were identified by the farmers along with hybrids improved high-yielding based on economic yield, acceptable quality of grain or pod and fodder in their region for cultivation (Table 4).

Table 4. Farmers' preferred improved cultivars suitable for dryland cropping in different districts

Crop	Improved cultivars	Suitability in districts
Finger millet (*ragi*)	L5	Responsive even at low input management, good fodder quality and higher grain yield. Suitable for Kolar, Chikkaballapur and Tumkur
	MR 1	Responsive to high input management, higher fodder and grain yield. Suitable to Davangere, Chitradurga and Tumkur
Groundnut	ICGV 91114	Short duration, drought tolerant. Suitable for Kolar, Chikkaballapur, Tumkur and Chitradurga
	GPBD 4	Foliar disease resistant, suitable for Davangere, Haveri and Dharwad.
Soybean	JS 93-05	Short duration, suitable in Dharwad and Haveri

Project Activities

Continued capacity-development of stakeholders (master trainers, DoA staff, FFs, lead farmers and farmers) during the years for sustainable natural resource management was ensured.

Crop Season 2009

Team building

- A team building workshop was organized on 2nd May 2009 in Bengaluru, to familiarize all stake holders of Bhoochetana project (Fig. 15). The Mission staff were exposed to goal of the Mission-mode project and objectives of the project; planning, coordination and implementation arrangements among stake holders were discussed and mechanism for monitoring the progress of implementation was decided. Schedules for cluster-wise detailed work plans preparation responsibilities were assigned to project staff. Modalities for ensuring availability of required inputs before the on-set of the season and strategy for their timely distribution to the farmers in each district were discussed.
- Review and planning meetings were organized at ICRISAT from 27–29 November 2010 and 6–8 January 2012 for Bhoochetana team (Figs. 16 & 17).
- Team building workshop was organized in Bengaluru on 5 March 2011 for Bhoochetana team (Fig. 17)
- District level, *taluk* level and cluster/village level trainings were organized for ADAs, AOs, FFs and lead farmers in the months of May and June in all the districts (Fig. 18 and Table 6).

Figure 15. Dr. K V Raju, Economic Advisor to Chief Minister, GoK motivating the officials to accept higher responsibilities to make Bhoochetana program successful in enhancing farmers' crop yields and income.

Figure 16. Review and planning meeting at ICRISAT 2010–11.

Figure 17. Review and planning meeting at ICRISAT 2011–12.


Figure 18. Village-, district-level trainings organized.

Table 6. Trainings conducted in thirty districts under Bhoochetana program during 2009–10 and 2011–12

		District-level		*Taluk*/village-level			
		No. of Trainings		No. of trainings			
Crop season	No. of districts	District level	Participants	*Taluk* level	Participants	Hobli/Village level	Participants
2009–10	6	19	1128	68	930	1806	33996
2011–12	30	37	3689	212	14158	2942	61687

Facilitation of Project Activities in the Mission Mode

- In the beginning of the crop season for the staff working in the newly added 10 districts, a team building exercise at Bengaluru was organized by ICRISAT and DoA to facilitate all stake holders from sixteen districts to come together for understanding of the mission mode approach to the project.
- Coordination with DoA staff for inputs mobilization, especially expediting the procurements or placing inputs at the disposal of field staff for easy distribution to farmers timely was harmonized. ICRISAT facilitated timely procurement of groundnut (ICGV 91114), pigeonpea cultivars, bajra hybrids and soybean cultivars by DoA.
- ICRISAT helped for timely arrangement of seeds of improved cultivars of sorghum, safflower, chickpea for *rabi* sowings for farmers of flood affected Haveri and Dharwad.
- ICRISAT staff participated and facilitated weekly reporting feedbacks and review meetings in each district to provide update of field activities and any assistance required for farmers' problems.
- Intense monitoring was conducted on field trials by DoA, ICRISAT and SCC members through direct contact of ICRISAT staff, farmers and field facilitators, DoA officials in districts using pocket telephone directory published by DoA.
- Regular SCC review meetings, their field visits in districts as well as meeting with UAS scientists in Bengaluru and Dharwad had helped to invigorate staff morale and commitment for project activities.

Awareness and Field Publicity Campaigns on Bhoochetana for Farmers

- Wall writings (Figs. 19 & 20) and exhibition of Bhoochetana posters in all villages within short period and media campaign with brochures and handouts were taken-up to popularize Bhoochetana.
- Print Media, TV news coverage was extensive to introduce Bhoochetana program to farmers and also on activities during the season in all districts, besides field facilitators and lead farmers contacts with individual farmers in selected village.

Figure 19. Wall writings in Kannada, on Bhoochetana goal and extent of its spread in the district.

Figure 20. Wall writing in Kannada on technologies appropriate to implement in farmers' fields for enhancing productivity.

Soil Nutrient Diagnostic Studies and Nutrient Input Recommendations

Stratefied Soil Sampling

Adopted scientific stratified, farmers participatory, soil sampling approach to cover 4700 villages in 30 districts and collected and analysed 92864 soil samples by ICRISAT and DoA for their nutrient status including micro and secondary nutrients (Table 7 and 8)

Table 7. Details of soil samples collected from farmers' fields in 30 districts of Karnataka during 2008, 2009 and 2010 seasons.

S.No.	No. of districts	Year of sampling	Samples analyzed at	No of villages selected	Total number of farmers' fields analysed
1.	6	2005–2008	ICRISAT	582	11609
2.	10	2009	ICRISAT	1773	34731
3.	14	2010	DoA	2344	46524
Total	30			4699	92864

Table 8. Diagnostic soil analysis of 92864 samples analyzed by ICRISAT/DoA from farmers' fields in 30 districts of Karnataka

	% deficient fields					
District/ (No. of fields)	OC %	Av P ppm	Av K ppm	Av S ppm	Av Zn ppm	Av B ppm
Bagalkot District (2440)	36	97	28	59	55	69
Belgaum District (4560)	29	95	52	2	68	74
Bellary District (2100)	32	90	33	67	19	36
Bengaluru Rural District (4448)	73	21	23	90	29	79
Bengaluru Urban District (2680)	58	10	14	6	37	60
Bidar District (2375)	40	48	1	83	62	66
Bijapur District (2791)	70	81	3	77	89	43
Chamarajanagar District (1640)	76	37	4	87	67	62
Chikaballapur District (2257)	78	37	34	80	52	80
Chikmagalur District (4140)	48	15	44	34	77	43
Chitradurga District (1489)	76	54	15	86	80	64
Dakshina Kannada District (1418)	2	29	71	21	65	44
Davanagere District (2968)	59	30	12	76	74	64
Dharwad District (1129)	31	53	1	79	44	39
Gadag District (1270)	75	65	2	85	92	34
Gulbarga District (3640)	60	64	1	83	86	71
Hassan District (10274)	48	23	18	82	50	91
Haveri District (1532)	55	42	5	85	60	46
Kodugu District (1160)	0	59	68	74	24	28
Kolar District (2161)	81	31	34	85	32	87
Koppal District (2499)	65	7	2	22	59	87
Mandya District (5479)	43	14	6	27	71	65
Mysore District (4860)	69	25	3	13	26	60
Raichur District (3343)	71	48	4	64	79	39
Ramanagara District (3068)	70	5	15	13	48	88
Shimoga District (6140)	23	41	46	34	36	36
Tumkur District (3041)	77	65	34	92	50	91
Udupi District (1000)	4	85	34	54	51	69
Uttar Kannada District (4980)	46	41	45	28	53	48
Yadgir District (1982)	74	48	5	72	90	58
Karnataka State (92864)	52	41	23	52	55	62

Sharing soil health status with stakeholders thru village meetings, village wall writings in Kannada and soil Health Cards in Figure 21, to individual farmers whose fields were sampled. Soil nutrient status was explained to farmers, farm facilitators and lead farmers.

Figure 21. Soil health cards with details printed on both sides of the sheet.

Sharing Soil Health Information with DoA Officials and Policymakers

District-wise Soil Nutrient Status Mapping

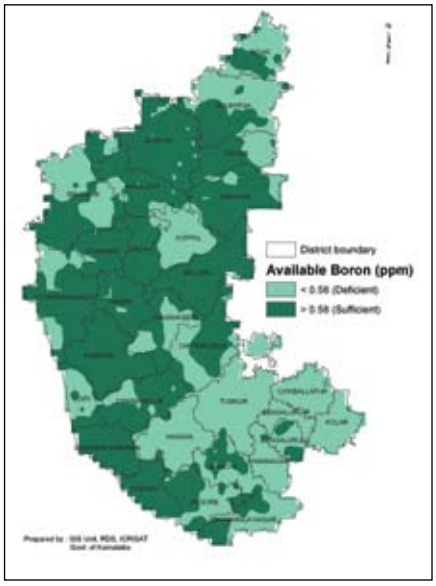

Figure 22. Soil available Zinc status in 16 districts of Karnataka.

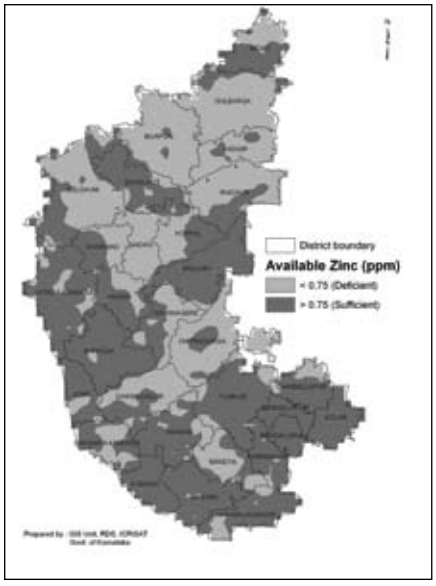

Figure 23. Soil available Boron status in 16 districts of Karnataka.

- Deficiencies of nutrients in soil and their effect on crop growth and yield along with recommendations were explained to the farmers.
- Soil fertility atlas was prepared and provided to all officials. We present 30 district (Figs. 22 & 23) which were done by 2010–11 crop season and provided to DoA, Karnataka in the form of soil fertility status Atlas (Fig. 24a & b). GIS based district-wise nutrient status maps for OC, P, K, S, Zn and Boron besides pH and Ec of all 30 districts were prepared based on the geo-referencing of sampled fields. Soil health information was also put in public domain on internet (http://intranet/gtaes/Projects/Bhoo%20Chetana/pdfs/596_2011.pdf)

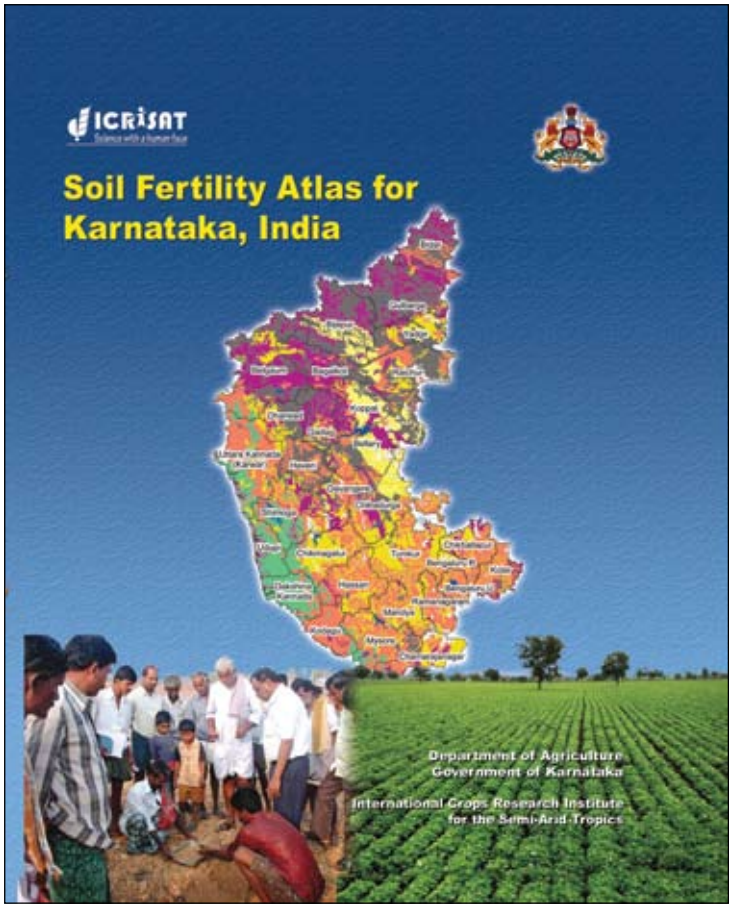

Figure 24a. Soil Fertility status Atlas for all nutrients for entire Karnataka published.

Taluk-wise Nutrient Recommendations, Fertilizer Dosage for *Kharif* Crops

- Soil analysis-based *taluk*-wise nutrient recommendations were developed by ICRISAT for all districts. Using revised SAUs recommendations including micronutrients for all the target crops (Table 9&10) were given.

Figure 24b. Soil Fertility status Atlas released by Hon'ble Chief Minister Government of Karnataka.

Table 9. Nutrient recommendations (revised) for different rainfed crops in *kharif* based on crop requirements

	Nutrient recommendation (kg ha^{-1})					
Crop	Nitrogen	P_2O_5	K_2O	Sulfur	Zinc	Boron
Ragi	100	50	50	30	5	0.5
Maize	80	50	30	30	5	0.5
Groundnut	25	50	20	30	5	0.5
Soybean	25	37	25	30	5	0.5
Sorghum	60	35	0	30	5	0.5
Sunflower	50	25	25	30	5	0.5
Cotton	120	60	60	30	5	0.5
Pearl millet	50	25	0	30	5	0.5
Green gram,	25	50	0	30	5	0.5
Black gram	25	50	0	30	5	0.5
Chickpea	25	50	0	30	5	0.5
Pigeonpea (MD)	25	50	0	30	5	0.5
Pigeonpea (SD)	40	50	0	30	5	0.5

Table 10. District/*taluk*-wise fertilizer dosage adjusted for soil test nutrients status and recommended nutrient requirement for rainfed crops in various districts for *kharif* 2010–11

Crop	District/*Taluk*	Fertilizers recommended (kg ha^{-1})					
		Urea	DAP	MoP	Gypsum	$ZnSO_4$	Agribor
Ragi	Chikkaballapur/C'ballapur	196	54	42	200	13	2.5
	Kolar/Kolar	294	82	32	200	13	2.5
	Tumkur/Korategere	175	109	83	200	13	2.5
Maize	Haveri/Byadagi	294	82	32	200	25	1.25
	Haveri/Shiggavi	131	82	32	200	13	2.5
	Chitradurga/Chitradurga	262	163	32	200	25	2.5
Groundnut	Kolar/Chintamani	33	54	17	200	25	2.5
	Tumkur/Pavgada	12	109	17	200	25	2.5
	Dharwad/Kundagola	12	109	17	200	25	1.25
Soybean	Dharwad/Dharwad	12	40	21	200	13	1.25
	Dharwad/Kalaghatagi	0	80	21	200	13	2.5
	Dharwad/Navalagund	23	80	21	200	25	1.25
Sorghum	Haveri/Hirekerur	116	38	0	200	13	1.25
	Dharwad/Kundagola	101	76	0	200	25	1.25
	Raichur/Raichur	116	38	0	200	25	2.5
Pearl millet	Bijapur/Bijapur	167	130	21	200	25	1.25
	Raichur/Manvi	192	65	21	200	25	1.25
Chickpea	Haveri/Ranebennur	44	109	0	200	25	1.25
Black gram	Bijapur/Bijapur	12	109	0	200	25	1.25
Green gram	Bidar/Bidar	6	54	0	200	13	2.5
Pigeonpea (MD)	Gulburga/Chincholi	12	109	0	200	25	2.5
Pigeonpea (SD)	Manvi	66	54	0	200	25	1.25

If Borax is applied in stead of Agribor, quantity needs to be doubled

Crop Planning

Identified major crops in the selected 30 target districts of Karnataka considering the annual crop statistics published by GoK for enhancing productivity of major dryland crops in each selected district. Cropping targets for *kharif* and *rabi* seasons were scaled in staggard manner annually as planned from 2009–10 to 2011–12 seasons (Table 11).

Table 11. *Kharif*/*rabi* seasons cropping planned and actual area sown during 2009–10 to 2011–12.

Crop season	District	Seasons/ crops	Target area crop-wise (Lakh ha.)	Total areas sown (Lakh ha.)	% area sown
2009–10	6	*Kharif*/4 crops	2.25	2.25	120
	3	*Rabi*/3 crops	0.59	0.59	100
2010–11	16	*Kharif*/12 crops	12.72	12.00	94
	10	*Rabi*/4 crops	3.70	3.32	90
2011–12	30	*Kharif*/14 crops	28.44	25.40	89
	11	*Rabi*/4 crops	6.6	5.40	82

Inputs Management

In rainy season 2011–12, Bhoochetana activities were targeted to cover an area of 2.95 million ha with improved management to enhance rainfed crop productivity in 30 districts. The project achieved a coverage of 2.66 million ha, which was 90% of the target area with four major food grain cereals (finger millet, maize, sorghum and pearl millet), four major grain legumes (pigeonpea, green gram, black gram, and cowpea) and three major oilseed crops (soybean, sunflower and groundnut) and a commercial crop (cotton) of Karnataka.

Use of recommended fertilizers and micronutrients by farmers was low during the first year of Bhoochetana project in new districts owing to less familiarity of technologies and their advantage to farmers. In the older districts where Bhoochetana was operationalized in the previous year, farmers purchased inputs knowing the advantage of inputs for enhancing their crop productivity and income (Table 12). Per hectare consumption of $ZnSO_4$ increase to double and Boron consumption increased five fold during third year of the project.

Table 12. Fertilizers (S, Zn and B nutrients) distributed to farmers in Bhoochetana project during three crop seasons from 2009–10 to 2011–12 in target districts.

	Gypsum distributed		$ZnSO_4$ distributed		Borax distributed	
Crop season	Tons	kg ha^{-1}	Tons	kg ha^{-1}	Tons	kg ha^{-1}
2009–10	4309	19.15	372	1.65	53	0.23
2010–11 (*Kharif*)	35376	29.50	2723	2.27	389	0.32
2010–11 (*Rabi*)	5595	16.86	362	1.09	113	0.34
2011–12 (*Kharif*)	96234	37.90	8775	3.46	2781	1.10
2011–12 (*Rabi*)	12475	21.87	1678	2.94	432	0.76

Crop Cutting Experiments for Crop yield Estimation: A Joint Evaluation

- Joint team of official from DoA, DES, UAS Scientists along with ICRISAT staff adopted a uniform crop sampling procedure across all the districts for crop cutting samples yield estimations.

- Identify registered farmers RSK bills and FFs who facilitated the farmers in the village to register/get the inputs.
- At *taluk* level, ADA/AO prepared the total list of identified farmers along with ICRISAT scientific associate and FFs/LFs in the villages.
- The lists of farmers at district level facilitated further monitoring and evaluations.
- At *taluk* level, ICRISAT staff/AO/ADA made at least two field visits in the cropping season to randomly selected farmers fields those coincide with the end of vegetative phase and flowering or maturity phase and field photos showing crop growth differences in individual farmer's fields were recorded.
- At the time of crop harvest, JDA's office prepared farmers' list for crop sampling randomly selecting farmers' fields which also had farmers' management treatment in the same farmer's field.
- Crop sampling was done only in the randomly selected farmers' fields in each village.

Procedure for Field Selection for Sampling

- In each village randomely selected three farmers' fields were sampled in 10% of villages in each *taluk* having farmers' management and improved management plots as per guidelines for crop sampling.
- A minimum of three randomly selected representative samples in each treatment from a farmer's field with a minimum sample size of 9 m^2 or even more crop area based on crop row orientation, aggregating to a minimum of 27 m^2 or more crop area was sampled in each treatment (Fig. 25).

Figure 25. Maize crop sampling in watersheds of Haver and groundnut crop sampling in Chickballapur districst.

- Total fresh weight of each sample (9 m^2 or more) was measured for three samples, and a sub-sample of 10–15 whole plants weighing up to 2 to 3 kg fresh weight was collected, weighed for recording fresh weight of sub-sample.
- In this process, we collected one sub-sample each from farmers' management and improved BC management of a farmers' field for moisture estimation and yield components estimation.
- The whole plant sub-samples were processed to separate pods and ear-heads from haulms and stalk.
- Thus collected two plant parts were properly labeled and bagged in *kora* cloth bags (pod or ear head) and muslin cloth bags (stalk) by ICRISAT staff for air/sun-drying for two to three days, and were sent to ICRISAT Patancheru campus for further processing and yield estimations.
- At ICRISAT, these plant samples were dried at constant temperature of 65–70^{O}C for 48 hrs in stabilized dryers, and dry weights were recorded.
- Grain/pod attributes were measured to understand quality and marketability of the produce.
- Although mean crop yields are provided for the purpose of summaries, individual farmers-wise crop yield, are also provided as annexure to the report
- Some subsamples of whole plant randomly collected were retained for processing by DoA staff which might serve as a counter check for yield estimations provided by ICRISAT.

Monitoring and Evaluation of Fields by State Coordination Committee (SCC)

- State level coordination committee members met frequently during the beginning of the season to take stock of inputs procurement and distribution arrangements, monsoon progression and crop sown statistics.
- Weekly reports/information from cluster villages, *taluks* to district, a checklist were prepared by ICRISAT to ensure follow-up weekly reporting synchronized from JDA office and ICRISAT staff.
- State level committee and Agriculture Minister reviewed the progress of activities and interacted with district level officials instantaneously through video-conferencing and addressed issues arising in the field (Fig. 26a&b)
- Agriculture Minister and other elected representatives also visited Bhoochetana fields and guided the district officials.

Figure 26a. State level coordination committee (SCC) review meeting through video conference in Bengaluru.

Figure 26b. A review meeting in Kolar by Mr S A Ravindranath, Hon'ble Minister of Agriculture.

Results of Participatory Crop Yield Estimation

Crop Season 2009–10

Intense monitoring by state level coordination committee at regular intervals facilitated by ICRISAT ensured good coordination of all stake holders to implement technologies resulted in crop yield increased between 35%–66% for farmers across six districts in the first year.

With Bhoochetana initiative, groundnut pod yields increased across all *taluks* of six districts in the range of 32% to 41%. *Ragi* farmers harvested an additional one ton of grain yield and 1.5 tons of fodder per hectare by adopting improved management along with balanced nutrition.

Groundnut

The consortium emerged with success of achieving productivity enhancement in the range of 32%–66% with four major crops in selected six districts (Figs. 27&28) of Karnataka even when rain fall was unfavourable to crop production in some of these districts.

In groundnut mean pod yields increase was between 32% and 43% and grain yields increase in maize was between 39% and 44% due to improved management over farmers' practice. Soybean seed yield increased with improved management by 39% over farmers' management.

- During post-rainy season, sorghum grain yield with improved management increased between 43% and 51% compared to farmers' management practices in these districts. Chickpea grain yield increased by 23% in Chitradurga and 34% in Dharwad with improved management over farmers' practices due to introduction of improved cultivars besides improved nutrient management even during receding moisture regime (Fig. 29). In Haveri, sunflower seed yield increased by 38% with improved management compared to farmers' management mainly because of increased nutrient use efficiency with balanced fertilizer use.

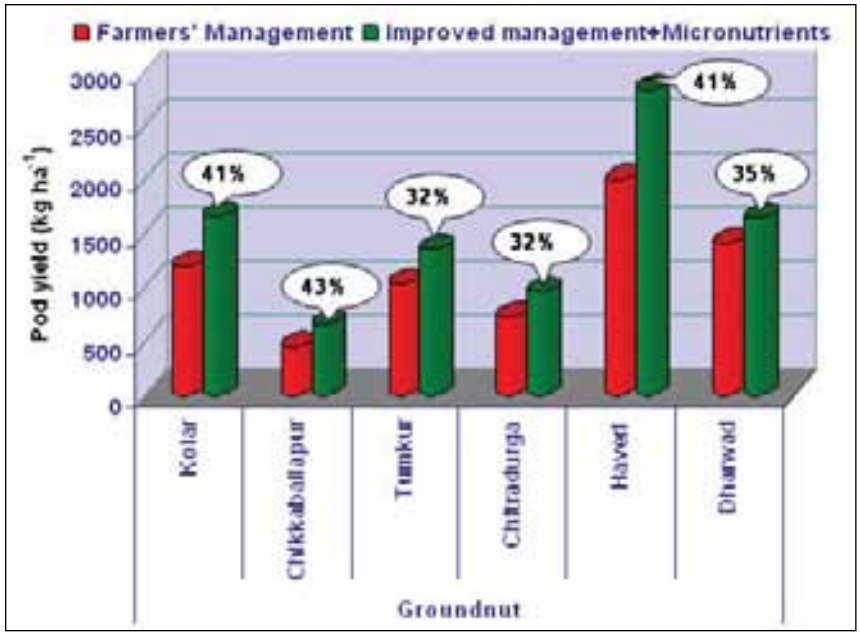

Figure 27. Groundnut pod yield increase (district-wise) with improved management compared to farmers' management in six districts of Karnataka during kharif 2009.

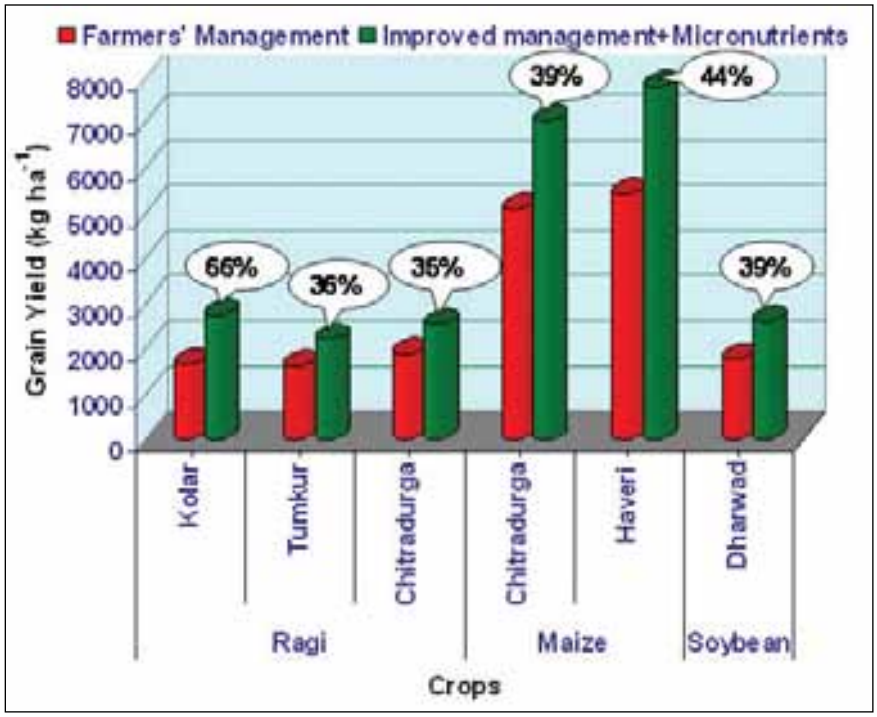

Figure 28. Grain yield increase in selected crops (district-wise) with improved management compared to farmers' management in five districts of Karnataka during kharif 2009.

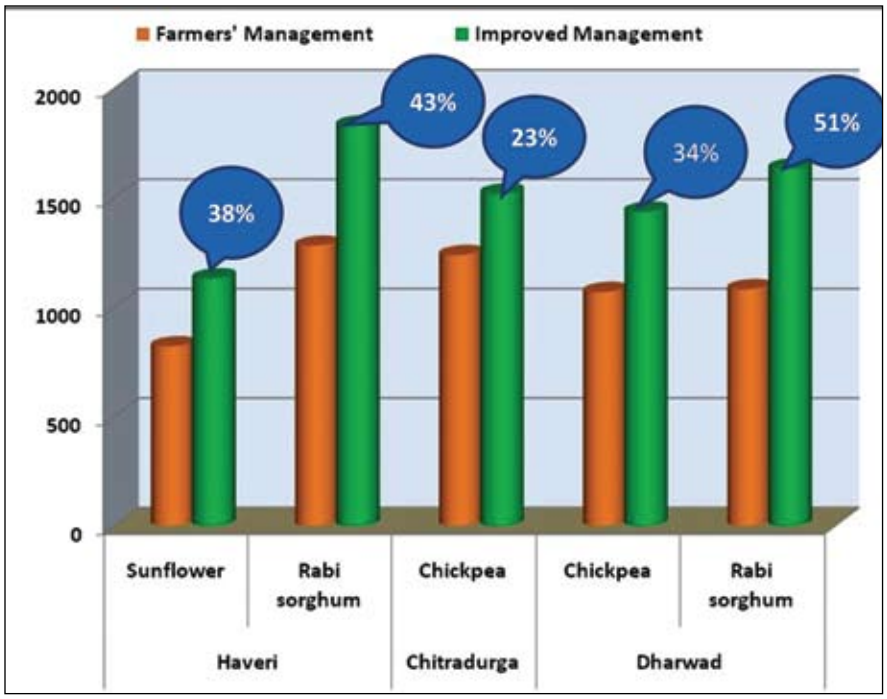

Figure 29. Rabi season crop yield increase with improved management in Haveri, Chitradurga and Dharwad districts during post-rainy season 2009-10.

Crop Season 2010–11

- Farmers harvested increased groundnut yields with improved management practices from 33–49% over the farmers practice yields, even with unfavourable condition of rain, farmers harvested 47% increased groundnut yields (470 kg ha^{-1}) over the farmers practices (320 ka ha^{-1}) (Fig. 30). Application of micronutrients also helped in increasing the shelling % up to 75% (59.2 to 75%) as compared to (57.7–67.8%) in farmers' management yields. Across districts groundnut pod yield increases was between 33% and 49% when compared to groundnut pod yield from farmers' management. Improved management in Bhoochetana project established the fact that farmers can advantageously adopt improved management for enhancing dryland crop productivity and seasonal gains with relatively investment intense crops like groundnut.
- A short duration crop like green gram also showed increased crop yields by 31–57% with improved management practices. A useful rainfall helped farmers for an over all increase in mean grain yields of 870 kg ha^{-1} with farmers' management as well as grain yield of 1200 kg ha^{-1} with improved management and mean grain yields of 540 kg ha^{-1} with farmers' management compared to grain yield of 710 kg ha^{-1} with improved management was achieved (Fig. 31). Grain yield of green gram increased with improved management in the range of 31% to 57%.

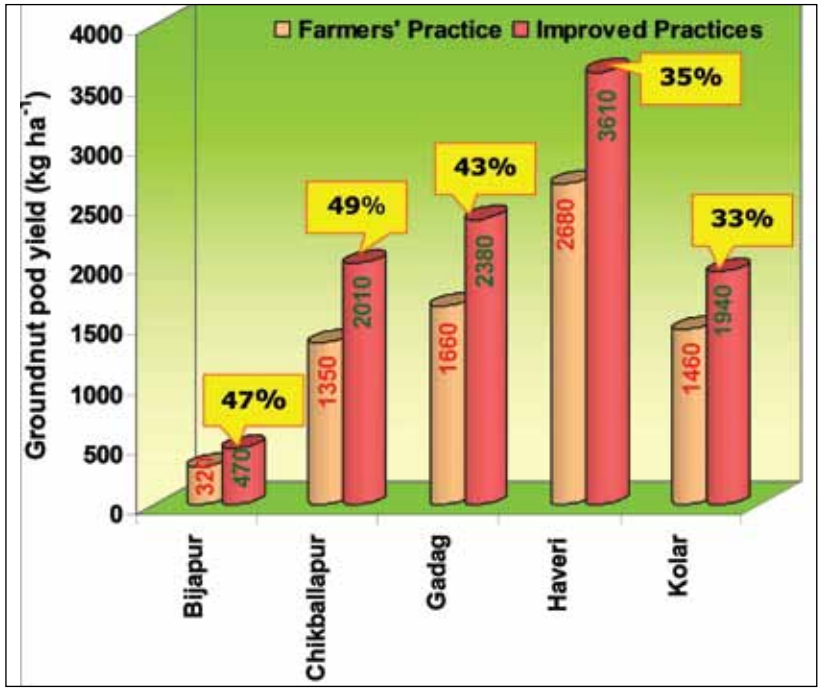

Figure 30. Groundnut pod yield with improved management compared to farmers' management in farmers' fields across five districts of Karnataka during kharif 2010-11.

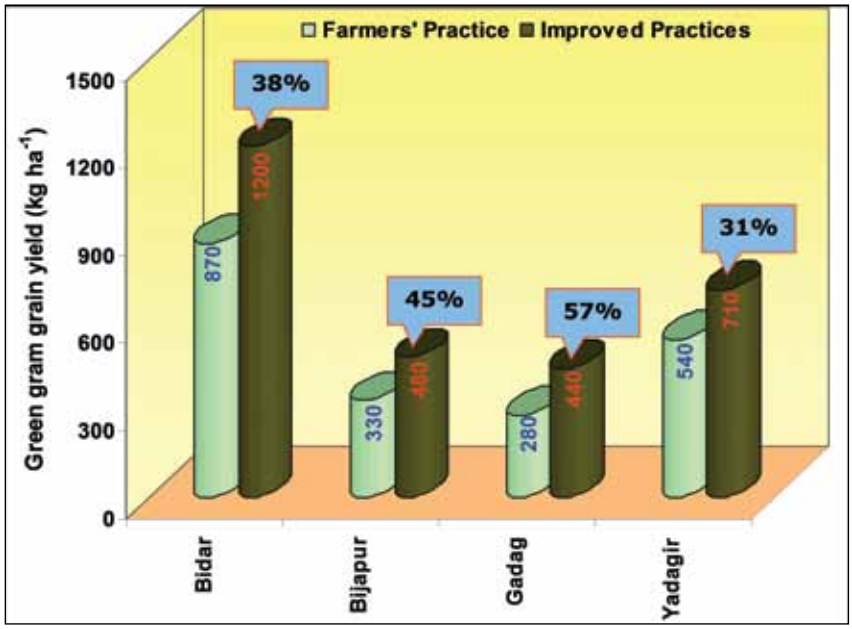

Figure 31. Green gram grain yields with improved practices compared to farmers' management in farmers' fields across four districts of Karnataka during kharif 2010-11 season.

- Maize yield with improved management reached up to 9.7 t ha^{-1} with 29% increase over 7.5 t ha^{-1} in farmers' practices. Benefit of improved management practices varied from 26% to 42% over the farmers' practices for maize (Fig. 32).
- The finger millet crop, which is generally considered as non-responsive crop by the farmers as well as researchers, also showed increased grain yields from 30–49% with improved management practices harvesting 3.7 t ha^{-1} of finger millet grain yield over the farmers' yield of 2.7 t ha^{-1}.
- Pigeonpea as intercrop as well as sole crop had done well with the improved management with enhanced grain yield in the range of 26% to 38% compared to farmers' management (Fig. 33). Grain yields were in the range between 900 kg ha^{-1} and 1600 kg ha^{-1} with farmers' management and 1160 kg ha^{-1} to 2230 kg ha^{-1} with improved management across different districts.
- Similarily, incrased grain yields with soybean varied from 24–27% with peral millet 21–37%, sorghum 25–39%.
- The cost benefit ratio for the additional investment made by the farmers, particularly on micronutrients even taking the full cost without any incentive, the cost benefit ratio for *ragi* varied from 1:3.5 to 7.8, for maize, 1:7.9 to 12.6, pearl millet 1:1.7 to 4.7, green gram 1:2.4 to 6.6, pigeonpea 1:4.6 to 11.4, groundnut 1:2.5 to 14.6, soybean 1:4.0 to 7.4 and sunflower 1:1.2 to 2.8 in different *taluks* of different districts. The economic viability of the interventions even without incentives provided by the government has been proven.

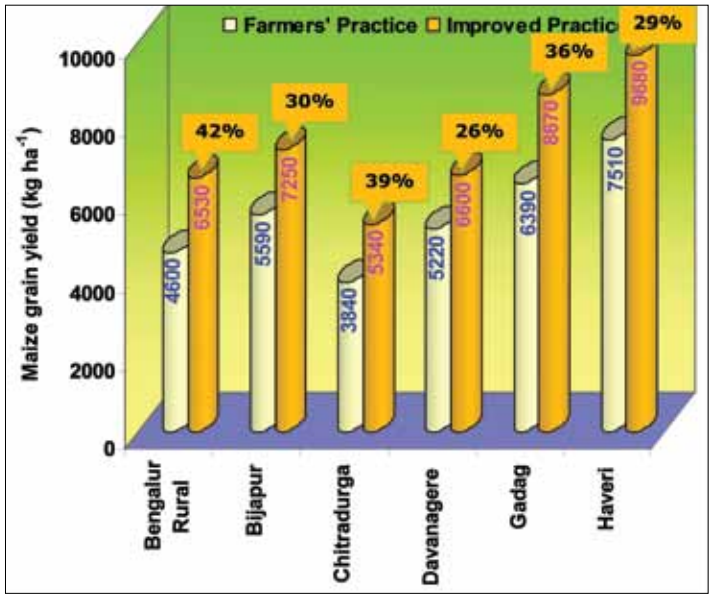

Figure 32. Maize grain yields with improved practices compared to farmers' management in farmers' fields across six districts of Karnataka during kharif 2010-11 season.

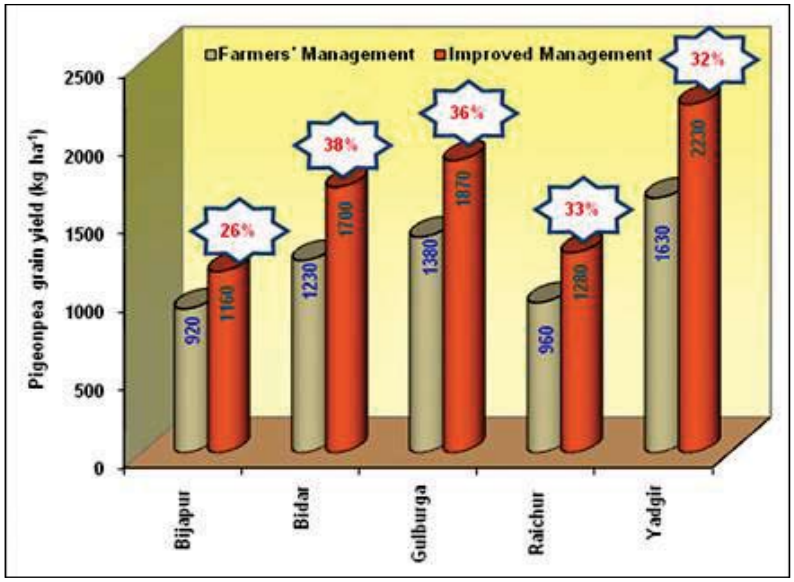

Figure 33. Pigeonpea grain yields with improved practices compared to farmers' management in farmers' fields across five districts of Karnataka during kharif 2010-11 season.

Finger Millet (*Ragi*)

- *Ragi* mean grain yield was the lowest, at 1420 kg ha^{-1} and the highest at 2610 kg ha^{-1} during *kharif* season 2010–11 from farmers' management (Fig. 34). Corresponding estimates for *ragi* grain yields with improved management were also lower at 1850 kg ha^{-1} with an increase of 30% over farmers' management, while higher grain yields of 3710 kg ha^{-1} was an increase of 42% compared to farmers' management.

Pearl Millet

- Pearl millet mean grain yield varied from a minimum of 1260 kg ha^{-1} to mean grain yield at a maximum of 1960 kg ha^{-1} with farmers' management (Fig. 35). While mean grain yield was at minimum of 1530 kg ha^{-1} to a mean grain yield at a maximum of 2670 kg ha^{-1} with improved management. However, mean grain yield in pearl millet increased between 21% and 37% with improved management compared to farmers' management in the these districts. Similar trends were observed with fodder yield increase as pearl millet stalk is generally used as fodder.

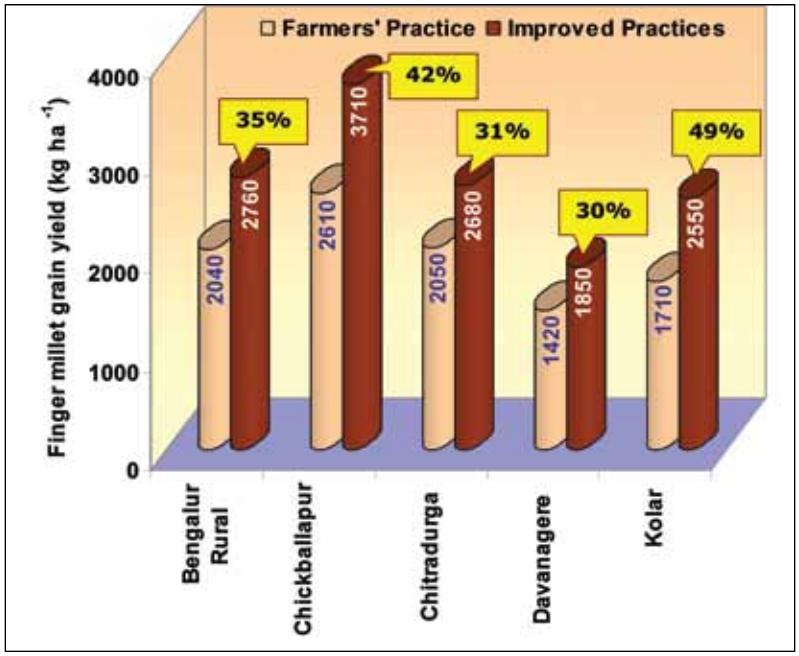

Figure 34. Finger millet (Ragi) grain yields with improved practices compared to farmers' management in farmers' fields across five districts of Karnataka during kharif 2010-11 season.

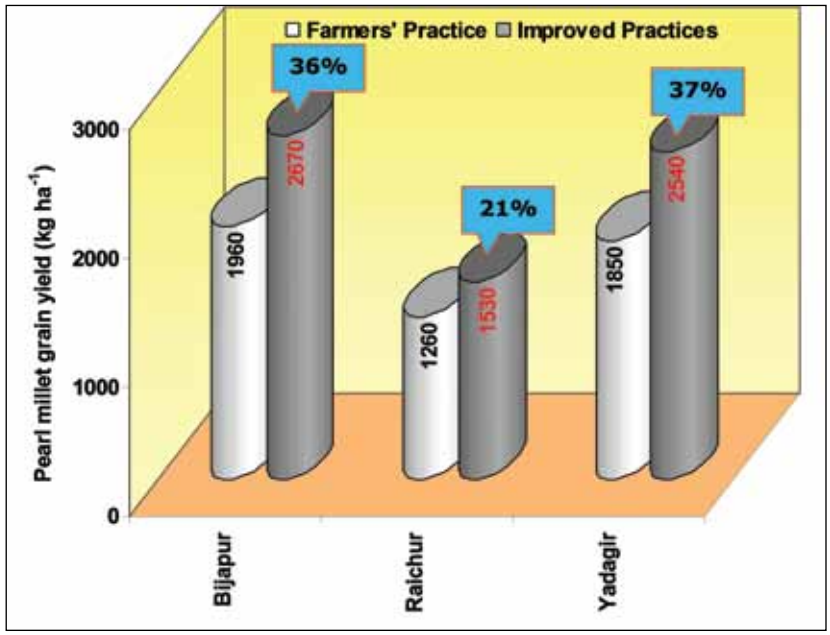

Figure 35. Pearl millet grain yields with improved practices compared to farmers' management in farmers' fields across three districts of Karnataka during kharif 2010-11 season.

Sorghum

- Sorghum mean grain yield estimates indicate that grain yield of 2320 kg ha^{-1} with improved management was an increase of 25% compared to grain yield of 1780 kg ha^{-1} with farmers' management (Fig. 36).
- Mean grain yield of 2290 kg ha^{-1} with improved management was an increase of 39% compared to mean grain yield of 1630 kg ha^{-1} sorghum with farmers' management.

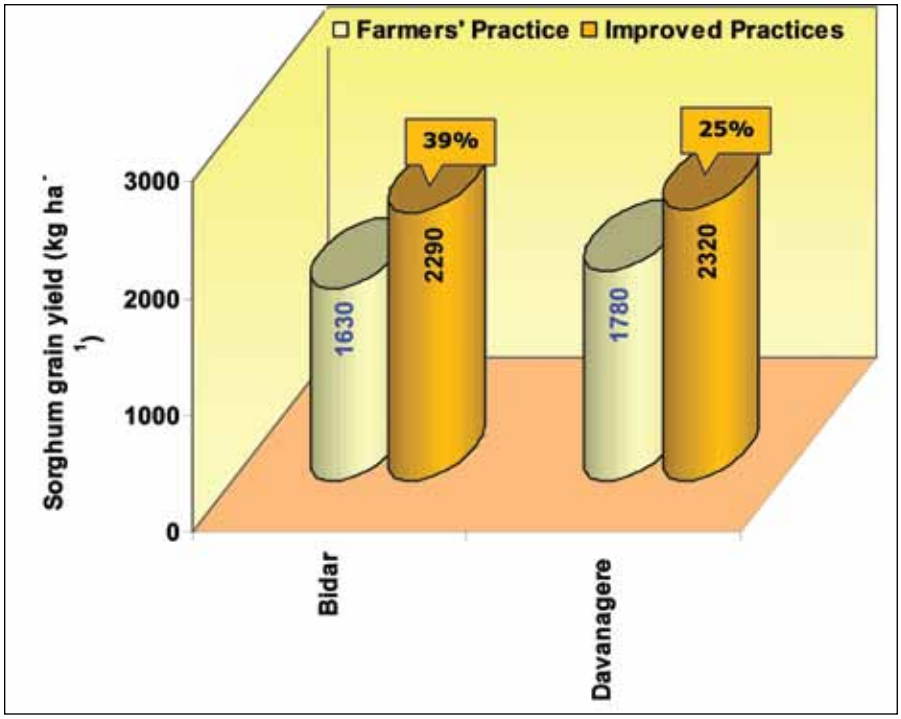

Figure 36. Sorghum grain yields with improved practices compared to farmers' management in farmers' fields across two districts of Karnataka during kharif 2010–11 season.

Post Rainy Season Crop Yield Estimates

- Chickpea grain yield were presented (Fig. 37) to compare the yield advantage of improved management over farmers' management in the district.
- Although confined by localized soil constraints and seasonal stress conditions, on an average farmers enhanced chickpea grain yield to the tune of 650 kg ha^{-1} (39%), and chickpea grain yield increased by 360 kg ha^{-1} (30%) and farmers gained by 360 kg ha^{-1} (27%) with improved management compared to usual farmers' management under Bhoochetana.

Figure 37. Grain yield of chickpea (kg ha^{-1}) in three districts with farmers practice and improved management practice under Bhoochetana during rabi seasons 2010–11.

Crop Season 2011–12

During the crop season 2011–12, low and erratic rainfall distribution across districts in Karnataka unevenly affected crop productivity. As a result, finger millet and pearl millet grain yields were recorded less than 2 t ha^{-1} even with improved management (IM). There was 24% yield increase in finger millet with improved management compared to farmers' management (FM), while the yield increase was 36% with IM compared to FM.

- Maize grain yield was enhanced by 32% with IM compared to FM across the state and sorghum grain yield also exhibited the trend with 40% increase (Fig. 38).
- In pulses, black gram grain yield increased by 33%; green gram grain yield increased in the range of 25% to 42% in response to IM when compared to FM (Fig. 39).
- Groundnut pod yield with FM was more than a ton ha^{-1}. Pod yield increase with IM were ranging from 26% to 53% (Fig. 40), almost 1 t ha^{-1} yield increase compared to FM. Response of soybean was good with 36% grain yield increase.

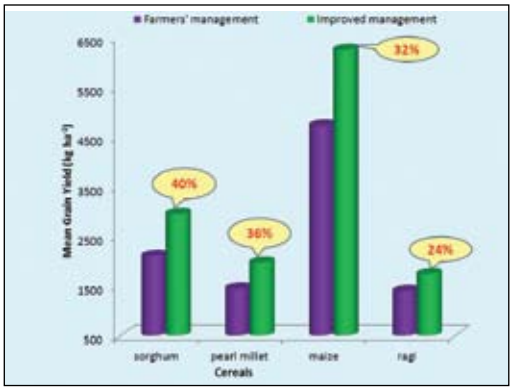

Figure 38. Cereal grain yield response to IM and FM during 2011–12 kharif season.

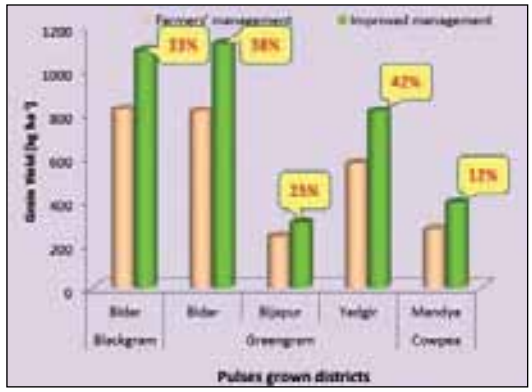

Figure 39. Pulses grain yield response to IM and FM during 2011–12 kharif season.

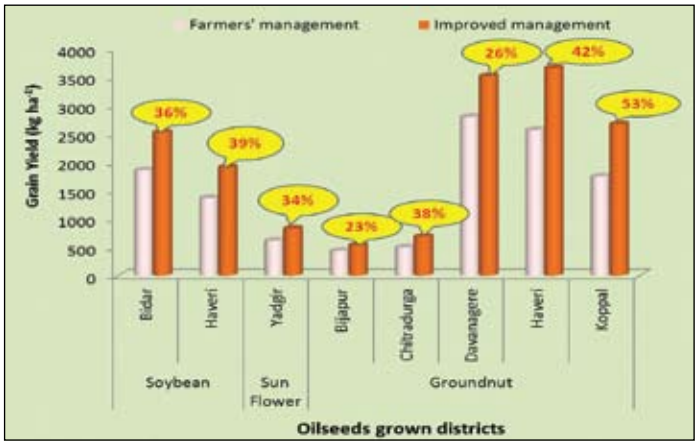

Figure 40. Groundnut pod yield response to IM and FM during 2011–12 kharif season.

Field Days and Field Visits

- For long season *kharif* crops (pigeonpea and cotton) and *rabi* crops (chickpea and *rabi* sorghum), field days were organized to demonstrate crop growth and yield enhancement with improved management including use of micronutrients and suitable improved varieties (Fig. 41).
- ICRISAT staff actively participated in week-long campaigns known as "*Krishi Utsav*" organized by DoA staff in many of the Bhoochetana districts.
- ICRISAT put up stall for demonstration of improved varieties seed, posters display on Bhoochetana activities and Tropicultor implements adjacent to stall and demonstrated the use of implements to farmers.
- ICRISAT co-sponsored a "*Krishimela*" (farmers' day) held at the University of Agricultural Sciences (UAS), Dharwad from 2 to 5 October. About 0.74 m farmers from across Karnataka and the surrounding states of Maharashtra and Andhra Pradesh participated.

- Around 203 field days were conducted to disseminate the results from the Bhoochetana program in all the 16 districts during 2010–11 where 15,500 farmers participated, and 4,500 were women farmers (Table 14).
- 567 field days were organized in 30 districts of Karnataka under Bhoochetana during the crop season 2011–12. Nearly 40,000 farmers were exposed to science-led improved technologies to enhance crop productivity on drylands. These farmers included nearly 10,000 women farmers in Karnataka.

Figure 41. Farmers' participation in field day.

Table 14. Details of field days held in different districts of Karnataka during 2011–12 cropping seasons.

Sl. No	No. of districts	No. of field days held	No. of farmers participated	Men	Women
2009–10	-	-	-	-	-
2010–11	6	203	15493	10939	4554
2011–12	28	567	39583	29853	9678

Audio-Visual and Print Media Publicity

- DoA state level senior officials and visiting scientists participated in the crop seminar organized by state-owned Doordarshan Channel and interacted with farmers to clarify farmers' questions, and emphasize about good agriculture practices (Fig. 42).
- A video film was produced with the help of DoA staff coordinated by ICRISAT technicians in the districts with an aim to introduce farmers, policy makers in the newly introduced districts to understand the goal and objectives of Bhoochetana and quickly acquaint themselves of the technologies, and the success of these technologies from the real beneficiary farmers' groups of the neighbouring districts, as the video includes farmers assessment of the program in enhancing their crops productivity and incomes (Fig. 43).

Figure 42. Doordarshan crop seminar.

Figure 43. Pictures of ICRISAT Bhoochetana documents.

Bhoochetana Documentary

- During the first year of project progress, besides awreness campaigns and publicity material, ICRISAT-DoA jointly brought out publications of booklets and a training manual (Fig. 44).
- A four-page flyer was prepared with brief content aimed at policymakers (English) and farmers (Kannada) to impress upon Bhoochetana concept, goals, activities and successes increasing rainfed crops productivity anywhere between 32 and 66% during the inception of the project in different districts.

Figure 44. ICRISAT-DoA published Bhoochetana documents.

Learnings

- Dryland farming community in Karnataka are receptive to knowledge-based improved agricultural practices and come forward willingly to undertake evaluations through participatory research as evident from good response.
- For achieving the desired impact in terms of increasing agricultural prouctivity of dryland systems, small and marginal farmers need to be enabled through training, exposure, demonstrations, ensuring availability of necessary inputs and handholding support.
- Timely availability of inputs as well as quality of the inputs are important bottlenecks for scaling-up the Bhoochetana inspite of good efforts from the DoA.
- Supply chain for quality inputs need to be strengthened and put in place ahead of the beginning of the season.
- Internalization of soil-test-based recommendations amongst DoA officials has to be a continuous process as new officers coming with some fixed ideas need to be sensitized as well as made aware with the mission strategy and approach.
- Regular review meetings conducted by DoA are good and showing its impact and Director and Commissioner have put good efforts which have contributed largely for the success as evident from the results during the second and third year. Similarly regular video conferencing improved the adopting with increased clarity and accountability.
- In new districts early identification of beneficiaries, farm facilitators and ensuring publicity and awareness building is must.
- Frequent meetings of the SCC at regular interveals are very effective and such meetings facilitated the mission project and helped in overcoming the bottlenecks to an extent and such meetings are must.

- Availability of good quality seeds of improved cultivars of groundnut, pigeonpea, *ragi*, chickpea, green gram, black gram is a problem in many districts. Development of seed banks by farmers' groups within villages help farmers to get quality seeds of their choice variety at cheaper rates.

Highlights

- Analysis of massive scale soil samples collected from farmers' fields in the districts to map nutrient status of soils using GIS and used the analysis to operationalise soil test-based *taluk*-wise fertilizer recommendations which is a novel and one of its kind mission initiatives in the country. It has established a proof of concept by documenting B:C ratios of 1.2 to 14.6 for additional income using market prices for the inputs.
- Crop production increase was at a minimum of 3.2% for soybean in Bidar to the highest of 31.4% for sorghum in Koppal district during 2011–12 *kharif* season
- The mission project has established good practices for knowledge dissemination, data recording, crop cutting and recording yields for computing state statistics and lot more need to be done yet to fully harness the agricultural potential in the state.
- It is piloting a new extension system on a large scale using farm facilitators and consortium approach for capacity building by linking knowledge generating institutions with knowledge disseminating line departments.
- Scientific approach and technical support enabled dryland farmers to enhance crop productivity significantly (32 to 66%) not only in the first year of implementation in 6 districts, but also continued and exceedingly well over a larger areas in sixteen districts with significant increase in crop productivity by 21 to 57% and 12 to 52% in 30 districts during rainy season for different crops.
- It is a project that takes up the integrated genetic and natural resource management through consortium of national and international research institutions to take care of the entire 'seed to food' chain. It brings improved agricultural technologies, seeds and other inputs for farmers' doorstep, besides building capacities of stake holders.
- Intense monitoring by high-power State Coordination Committee at regular intervals, helped with midcourse corrections, ensured project deliverables in time and achieved the objectives with success.

Table 15. Effect of micronutrients on groundnut pod filling with improved management compared to farmers' management in different districts of Karnataka.

District	FM % shelling	IM+micronutrients % shelling
Haveri	67.8	74.9
Dharwad	57.7	59.2
Kolar	65	65.3
Tumkur	64.9	65.5

Farmers observed higher number of tillers and good root growth with improved management in finger millet (Fig. 45).

Table 16. Effect of micronutrients on groundnut pod filling with improved management compared to farmers' management in different districts of Karnataka.

District	FM % shelling	IM+micronutrients % shelling
Bijapur	67	67
Chickballapur	65	67
Gadag	65	66
Haveri	68	69
Kolar	67	67

Impacts of Improved Crop Growth and Product Quality

Figure 45. Improved tillering and root growth of finger millet with micronutrients application.

Economic Impacts of Technologies to Farmers

- Simple measure of additional income per every rupee of additional investment was calculated based on additional net income and investment on micronutrients per hectare (Table 17).

Table 17. District-wise crop yield increase in farmers' fields with improved management compared to farmers' management under Bhoochetana project, 2010–11.

Crop	District	Farmers' management (kg ha^{-1})		Improved management (kg ha^{-1})		% increase in production		Additional income at MSP (Rs ha^{-1})	Additional income per rupee invested
		Stalk	Grain	Stalk	Grain	% Stalk increase	% Grain increase		
Ragi	Bengaluru R	4730	2040	6240	2760	32	35	9060	5.7
	Chikballapur	2090	2610	3290	3710	57	42	12300	7.8
	Chitradurga	2820	2050	3730	2680	32	31	7350	4.7
	Davangere	2970	1420	3970	1850	34	30	5550	3.5
	Hassan	4020	1650	5420	2290	35	39	8140	5.1
	Kolar	2720	1710	3820	2250	40	49	6750	4.3
	Tumkur	2890	830	3540	980	22	18	2360	1.5
	C'rajanagar	1930	1331	2183	2093	13		7710	4.9
Maize									
	Bengaluru R	3460	4600	4450	6530	29	42	17550	11.1
	Bijapur	3160	5590	4130	7250	31	30	15160	9.6
	Chitradurga	2160	3840	2850	5340	32	39	13590	8.6
	Davangere	2170	5220	2860	6600	32	26	12540	7.9
	Gadag	3210	6300	4920	8340	53	32	18930	12.0
	Haveri	5940	7510	7370	9680	24	29	19910	12.6
	C'rajanagar	5333	1776	9194	3078	72	73	13660	8.6
Pearl millet									
	Gulburga	1600	1590	2060	2080	29	31	4580	2.9
	Bijapur	2020	1960	2730	2670	35	36	6650	4.2
	Yadgir	3270	1850	4220	2540	29	37	6620	4.2
	Raichur	1580	1260	2050	1530	30	21	2650	1.7
Sorghum									
	Bidar	1840	1630	2500	2290	36	40	6190	3.9
	Davangere	3420	1780	4230	2320	24	30	5220	3.3
	C'rajanagar	2227	1428	3031	2215	36	55	7390	4.7

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Continued

Table 17. District-wise crop yield increase in farmers' fields with improved management compared to farmers' management under Bhoochetana project, 2010–11.

Crop	District	Farmers' management (kg ha^{-1})		Improved management (kg ha^{-1})		% increase in production		Additional income at MSP (Rs ha^{-1})	Additional income per rupee invested
		Stalk	Grain	Stalk	Grain	% stalk increase	% grain increase		
Black gram									
	Bidar	1690	930	2460	1260	46	35	9570	6.1
Green gram									
	Bidar	1310	870	1790	1200	37	38	10460	6.6
	Bijapur	460	330	620	480	35	45	4760	3.0
	Gadag	590	280	820	440	39	57	5070	3.2
	Gulburga	1520	460	2180	590	43	28	4120	2.6
	Yadgir	470	540	590	710	26	31	3800	2.4
Pigeonpea									
	Bidar	5990	1230	7950	1700	33	38	14100	8.9
	Bijapur	1870	920	2550	1160	36	26	7200	4.6
	Gulburga	5090	1380	6620	1870	30	36	14700	9.3
	Raichur	1470	960	1860	1280	27	33	9600	6.1
	Yadgir	8520	1630	11080	2230	30	37	18000	11.4
Groundnut									
	Bijapur	680	320	950	470	40	47	3990	2.5
	Chikballapur	1090	1350	1760	2010	61	49	16520	10.5
	Dharwad	1737	2062	2090	2906	20		20118	12.7
	Gadag	1750	1590	2580	2230	47	43	16380	10.4
	Haveri	3100	2680	3950	3610	27	35	23090	14.6
	Kolar	1900	1460	2560	1940	47	33	15780	10.0
	Tumkur	1049	899	1305	1120	27	25		
	C'rajanagar	1105	1109	1553	1733	41	56	15248	9.7
Soybean									
	Bidar	890	2100	1260	2910	42	39	11660	7.4
	Haveri	900	1790	1540	2230	71	25	6340	4.0
	Dharwad	3033	1516	4810	2333	59	55	11770	7.4
Sunflower									
	Bijapur	1960	870	2470	1060	26	22	4470	2.8
	Yadgir	1950	410	2310	490	18	20	1880	1.2

- During this season groundnut was the best earner for farmers across seven districts in a range of Rs. 10 to Rs. 14.5 per every rupee of additional investment on micronutrients as pod yield and groundnut fodder fetches good market price.
- Maize was also valued by farmers as the second best earner with an additional income in the range of Rs. 8 to to Rs.12.6 as it produced higher quantum of grain and fodder yield in good seasonal conditions in seven districts.
- Pigeonpea as sole in some districts and intercrop with groundnut, green gram or millet fetched higher additional returns in the range of Rs. 4.5 to 11.5 per every rupee invested by farmers.

Awards for Government of Karnataka

- Krishi Karman Award for the highest productivity of coarse cereals through Bhoochetana. This award was instituted to recognize state's contribution to increase the food production in the country.
- Agriculture Leadership Award – 2011 as a best performing state by Agriculture Today

Impacts of Enhanced Productivity

- During 2011–12, we estimated the production increase with IM from the area that received possibly all micronutrients. Remaining area sown to crop was considered to have farmers' management and estimated yield with farmers' management. Summation of total production with IM and total production from the remaining area with FM gave total production in the district. Further we estimated percent increase in production of a crop in the district (Table 18). The lowest estmate of increased production was 3.2% with soybean in Bidar, and the highest increase in production was 31% with sorghum in Koppal district. Production increase was the highest with maize in Davangere nearly 1 lakh tons increase followed by 0.6 lakh tons maize production increase in Haveri district. The increase according to current estimates in production was nearly 2.2 lakh tons from only eight districts during *kharif* 2011–12.
- In conclusion, this novel approach as a proof of concept for demonstrating productivity enhancement through science-based approach has benefitted large number of farmers during the three years and has laid a strong foundation for scaling-up the initiative to cover 100% of the trarget area in all 30 districts of Karnataka during the ensuing year.
- The success within a short period for Bhoochetana has been achieved largely because of instense monitoring and guidance by the senior policy makers in the state and efforts of the DoA staff in all the districts ensuring the convergence of various government schemes through Bhoochetana. Capacity building has played an important role in the success what is achieved in this program.
- Institutional building was the keystone element for the success of Bhoochetana. Farm facilitators, lead farmers concept in the program was first in its kind to meet the required extension help for large number of farm families in rural areas. District and state level coordination committees monitor the work progress periodically through video conference as well as in-house meetings with concerned staff.
- Convergence: Taking leads from past developmental programs/schemes, we learnt that that focus on solution to a single problem in agriculture facing multiple has been the prominent reason which made them fail and did not allow to achieve success to the desired level. Therefore, keeping this in mind, all major schemes running in the departments were converged with Bhoochetana program so that farmers get holistic solution to the overall problem of increasing productivity.

Table 18 Impact of improved technologies in Bhoochetana project evidenced by crop-wise enhanced productivity and increased total production (tons) of pulse crops in the districts of Karnataka during 2010–11 *kharif* crop season.

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Black gram	Bidar	28481	20848	3930	820	1090	1061	17095	18157	6.2
	Gulbarga	39000	18834	2457	410	560	369	7722	8090	4.8
Total (Black gram)		67481	39682	6387	-	-	1430	24817	26247	
Cowpea	Mandya	2500	2234	575	270	400	75	603	678	12.4
Field bean	Kolar	4500	1417	608	1490	1940	273	2111	2385	12.9
Green gram	Bagalkot	8500	8500	6885	230	340	757	1955	2712	38.7
	Bidar	24812	16624	3424	810	1120	1061	13465	14527	7.9
	Bijapur	5500	2928	622	240	300	37	703	740	5.3
	Yadgir	32000	24357	4384	570	810	1052	13883	14936	7.6
	Dharwad	10000	7075	2640	950	1380	1135	6721	7856	16.9
	Gadag	73000	55211	32741	760	1080	10477	41960	52437	25.0
	Gulbarga	35000	9396	2205	480	690	463	4510	4973	10.3
Total (Green gram)		188812	124091	52900			14983	83198	98182	
Pigeonpea	Bellary	4300	4098	559	620	920	168	2541	2708	6.6
	Bidar	41038	40217	5663	790	1030	1359	31771	33131	4.3
	Bijapur	88500	44788	10001	740	980	2400	33143	35543	7.2
	Kolar	2200	2384	297	1360	1850	146	3242	3388	4.5
	Ramanagara	2700	2700	297	1010	1430	125	2727	2852	4.6
	Yadagir	40000	47366	5480	660	850	1041	31262	32303	3.3
	Davanagere	4000	3755	2480	470	560	223	1765	1988	12.6
Total (Pigeonpea)		182738	145308	24777			5462	106451	111913	
Grand Total (Pulses)		446031	312732	85247	-	-	22223	217181	239404	

Table 18 *Continued.*

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Maize	Bagalkot	27800	27800	22518	4560	6050	33552	126768	160320	26.5
	Bellary	32000	33,332	4160	1440	1990	2288	47998	50286	4.8
	Bengaluru_R	5600	5600	2016	4650	5780	2278	26040	28318	8.7
	Bijapur	34800	24080	3932	4160	5440	5033	100173	105206	5.0
	Chikballapur	27900	36992	4743	2620	3390	3652	96919	100571	3.8
	Chikkamagaluru	7500	7500	4883	4810	6760	9521	36075	45596	26.4
	Chitradurga	64500	63860	14448	2990	3920	13437	190941	204378	7.0
	Hassan	34800	34800	5881	4340	5610	7469	151032	158501	4.9
	Haveri	128500	128500	30429	6070	8070	60858	779995	840853	7.8
	Kodagu	2000	2000	329	7380	9670	753	14760	15513	5.1
	Koppal	12500	16968	3375	2810	4040	4151	47680	51831	8.7
	Mandya	1500	1482	345	930	1190	90	1378	1468	6.5
	Shimoga	16800	16800	4200	4370	5970	6720	73416	80136	9.2
	Davanagere	104000	103005	64480	5410	6960	99944	557257	657201	17.9
	Dharwad	20000	19750	5280	9260	11220	10349	182885	193234	5.7
	Gadag	54000	58095	24219	4500	6300	43594	261428	305022	16.7
Total (Maize)		574200	580564	195238	-	-	303689	2694745	2998434	
Paddy	Dkn. Kannada	5200	5200	4456	4320	5710	6194	22464	28658	27.6
	Kodagu	17000	17000	2797	6140	7460	3691	104380	108071	3.5
	Shimoga	35600	35600	8900	5050	6470	12638	179780	192418	7.0
	Udupi	10000	10000	880	4030	5210	1038	40300	41338	2.6
Total (Paddy)		67800	67800	17033	-	-	23562	346924	370486	

Table 18 *Continued.*

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Pearl millet	Bagalkot	15000	15000	12150	3230	4580	16403	48450	64853	33.9
	Bijapur	17800	17742	2011	1560	2050	986	27678	28663	3.6
	Koppal	31000	32900	8370	760	1240	4018	25004	29022	16.1
	Raichur	25000	18,020	5800	1260	1520	1508	22705	24213	6.6
	Ydagir	22000	21403	3014	1690	2250	1688	36171	37859	4.7
	Gulbarga	19700	13228	1241	1670	2410	918	22091	23009	4.2
Total (Pearl millet)		130500	118293	32587	-	-	25520	182099	207618	
Ragi	Bengaluru (U)	11200	11200	5376	2180	2930	4032	24416	28448	16.5
	Bengaluru_R	30000	30000	10800	1930	2610	7344	57900	65244	12.7
	Hassan	44700	16830	7554	1470	1910	3324	24740	28064	13.4
	Kolar	44000	24550	5940	1470	1880	2435	36089	38524	6.7
	Mandya	19200	12285	4416	430	560	574	5283	5857	10.9
	Mysore	19500	13850	1775	2170	2680	905	30055	30959	3.0
	Ramanagara	47200	44806	5192	2210	3100	4621	99021	103642	4.7
	Tumkur	155000	146630	44330	790	820	1330	115838	117168	1.1
	Chitradurga	25000	24760	5600	510	740	1288	12628	13916	10.2
	Davanagere	5000	4105	3100	1400	1740	1054	5747	6801	18.3
Total (*Ragi*)		400800	329016	94083	-	-	26907	411715	438622	
Sorghum	Bellary	6000	5345	780	1960	2790	647	10476	11124	6.2
	Bidar	37314	27985	5149	2080	2800	3708	58209	61916	6.4
	Koppal	4000	1608	1080	1070	1570	540	1721	2261	31.4
	Davanagere	135600	130574	84072	2670	3780	93320	348633	441953	26.8
Total (Sorghum)		2529514	2356858	768962	-	-	98215	419038	517253	
Grand Total (Cereals)		3635014	3384731	1090869			454331	3707597	4161928	

Table 18 *Continued.*

Crop	District	Target area	Area sown	Area nutrient applied (ha)	Yield with FM (kg ha^{-1})	Yield with IM (kg ha^{-1})	Production increase with IM	Production with FM	Total production	Production % increase
Soybean	Bagalkot	1500	1500	1215	950	1460	620	1425	2045	43.5
	Bidar	22050	35059	3043	1860	2530	2039	65210	67248	3.1
	Haveri	7000	7000	1658	1370	1910	895	9590	10485	9.3
	Dharwad	10000	10000	2640	850	1130	739	8500	9239	8.7
Total (Soybean)		40550	53559	8556	-	-	4293	84725	89017	
Sunflower	Bagalkot	6200	6200	5022	2190	2860	3365	13578	16943	24.8
	Bellary	2000	1700	260	1880	2650	200	3196	3396	6.3
	Bijapur	12600	8371	1424	1260	1660	570	10547	11117	5.4
	Gulbarga	27200	8057	1714	940	1390	771	7574	8345	10.2
	Yadagir	11100	11074	1521	620	830	319	6866	7185	4.7
Total (Sunflower)		59100	35402	9940			5225	41761	46986	
Groundnut	Bellary	27800	28066	3614	730	1040	1120	20488	21609	5.5
	Bijapur	17800	7195	2011	320	400	161	2302	2463	7.0
	Chikballapur	42000	29351	7140	940	1470	3784	27590	31374	13.7
	Chitradurga	96000	67951	21504	500	690	4086	33976	38061	12.0
	Davanagere	5000	3628	3100	2800	3520	2232	10158	12390	22.0
	Haveri	15000	15000	3552	2570	3660	3872	38550	42422	10.0
	Koppal	9000	4430	2430	1750	2670	2236	7753	9988	28.8
	Raichur	5500	2990	1276	910	1180	345	2721	3065	12.7
	Dharwad	20000	19000	5280	1500	1940	2323	28500	30823	8.2
	Gadag	59000	40956	26462	1260	1870	16142	51605	67746	31.3
Total (Groundnut)		496400	396489	113360	-	-	36300	223642	259942	
Grand total (Oilseeds)		596050	485450	131856	-	-	45817	350128	395945	

Bhoochetana- *Kharif* 2011–12: District-wise progress

Sl. No.	Districts	No. of villages to be covered	No. of cluster godowns	No. of farmer facilitators selected	No. of lead farmers selected	Farmer field schools	Area (in ha) target	Area sown	No.of farmers registered
1	Kolar	1082	125	125	625	5	62200	50271	105737
2	Chickballapur	1384	243	243	1215	26	123600	115225	143075
3	Tumkur	2091	292	570	2850	61	285000	232255	239495
4	Chitradurga	628	209	371	1855	22	185500	156571	139831
5	Haveri	656	140	446	2230	19	223000	221857	178400
6	Dharwad	341	120	120	600	14	60000	56500	48450
7	Bangalore(R)	556	77	77	385	17	35600	35600	44546
8	Chamaraj nagar	189	86	112	630	16	55900	54810	37244
9	Hassan	992	195	193	968	23	94400	86252	91900
10	Davangere	376	114	270	1345	18	135600	128424	100505
11	Gadag	174	44	250	0	0	125000	107352	82965
12	Bijapur	280	93	354	1770	18	177000	105104	109054
13	Raichur	376	63	140	720	25	72000	59027	49648
14	Gulbarga	538	201	671	3396	32	335900	295495	76844
15	Yadgiri	210	80	194	978	16	105100	104200	42003
16	Bidar	360	39	307	1537	30	153600	142931	144836
17	Bagalkot	280	128	130	650	78	64800	62700	61922
18	Belgaum	508	150	175	925	34	87500	87500	87676
19	Bellary	137	41	137	680	20	72100	72100	39665
20	Chikka magalur	526	114	132	660	34	66000	65568	62250
21	Koppal	146	48	139	695	16	71000	64257	33250
22	Mandya	230	47	47	235	27	23200	16001	32425
23	Mysore	434	115	117	590	33	58300	51307	48621
24	Ramanagar	226	101	100	500	18	49900	47506	54511
25	Shimoga	432	108	108	540	40	52400	51275	47886
26	Bangalore(U)	159	24	25	125	15	11200	11200	11613
27	D.Kannada	72	17	12	60	12	5200	5200	4612
28	Kodagu	58	16	39	195	16	19000	19000	25260
29	U.Kannada	373	48	48	240	35	24000	23600	33331
30	Udapi	50	18	20	100	9	10000	10000	28247
	Total	13864	3096	5672	27299	729	2844000	2539088	2205802

Bhoochetana-*Rabi* 2011–12: District-wise progress report

Sl. No.	Districts	No. of villages	No. of cluster godowns	No. of farmer facilitators selected	No. of lead farmers selected	Farmer field schools	Area (in ha) target	Area sown	No.of farmers registered
1	Haveri	279	61	75	375	6	37500	20068	13465
2	Dharwad	175	30	76	380	9	38000	36700	26545
3	Davangere	41	12	13	65	6	6000	4400	2645
4	Gadag	158	37	151	0	0	75000	63804	67500
5	Bijapur	206	75	160	800	0	80000	63804	50775
6	Raichur	254	38	135	675	0	67800	59645	37760
7	Gulbarga	141	31	112	558	0	55709	49639	8690
8	Yadgiri	210	7	44	220	16	22000	19034	7953
9	Bidar	360	30	97	1537	15	48532	38825	45875
10	Bagalkot	334	73	186	900	64	93580	85590	41830
11	Belgaum	140	40	143	580	15	76000	80067	14475
12	Bellary	96	0	70	390	13	35200	33595	7034
13	Koppal	103	29	52	260	0	26000	15360	29041
	Total	2497	463	1314	6740	144	661321	570531	353588

Bhoochetana 2012 Programme, Action Plan & Guidelines

Bhoochenata State Level Programme for the Year 2012–13

Kharif 2012–13 area district-wise, crop-wise area with percent share area (ha)

Sl. No	District	*Ragi*	Maize	Sorghum	Bajra	Paddy	Gnut	Soybean	Sun flower	Red gram	Green gram	Black gram	Avare	Cow pea	Cotton	Total
1	Bagalkot	0	34000	1500	22000	0	500	3000	5000	5000	26500	0	0	0	0	97500
2	Belgaum	0	40000	23000	15000	64000	35000	80000	5000	5000	24000	3000	0	2000	30000	326000
3	Bellary	0	59000	25000	12000	0	56000	0	28000	9000	0	0	0	0	15000	204000
4	Bidar	0	2500	58000	7500	0	0	74000	6000	66000	38000	40000	0	0	0	292000
5	Bijapur	0	35000	0	28500	0	27000		20500	175000	12000	0	0	0	0	298000
6	B'lore(R)	44000	10000	0	0	0	0	0	0	0	0	0	0	0	0	54000
7	B'lore(U)	20000	0	0	0	0	0	0	0	0	0	0	0	0	0	20000
8	Chamaraja nagar	17000	29000	18000	0	0	16000	0	16000	0	3000	5000	3000	3000	2000	112000
9	Chikka ballapur	41000	39000	0	0	0	32500	0	0	8000	0	0	5000	0	0	125500
10	Chikka magalur	51000	25500	1000	0	32000	5000	0	8000	0	3500	0	3500	0	0	129500
11	Chitradurga	38000	81000	5000	0	0	146000	0	0	11000	4000	0	0	0	0	285000
12	D.Kannada	0	0	0	0	25000	0	0	0	0	0	0	0	0	0	25000
13	Davanagere	12000	150000	14000	0	0	12000	0	4000	4000	0	0	1000	0	30000	227000
14	Dharwad	0	30000	0	0	11000	30000	33000			25000	0	0	0	24000	153000
15	Gadag	0	12000	8000	1500	0	60500	0	3000	3000	79500	0	0	0	12500	180000
16	Gulbarga	0	0	0	18000	0	5000	0	46000	320000	41000	54000	0	0	0	484000
17	Hassan	74000	70000	2000	0	6000	0	0	10000	2000	11000	2000	5000	11000	0	193000
18	Haveri	0	125000	8000	0	16000	15000	10000	0	4000	3000	1000	0	0	79000	261000
19	Kodagu	0	3000	0	0	29500	0	0	0	0	0	0	0	0	0	32500

Bhoochenata State Level Programme for the Year 2012–13 (*Continued*)

Kharif-2012–13 district-wise, crop-wise area with percent share area (ha)

Sl. No	District	*Ragi*	Maize	Sorghum	Bajra	Paddy	Gnut	Soybean	Sun flower	Red gram	Green gram	Black gram	Avare	Cow pea	Cotton	Total
21	Koppal	0	30000	7000	63000	0	16000	0	18000	10000	16000	0	0	0	0	160000
22	Mandya	62500	4000	0	0	0	1000	0	0	0	0	0	0	4500	0	72000
23	Mysore	44000	26000	10000	0	0	5000	0	1000	3000	6000	9000	18000	29000	44000	195000
24	Raichur	0	0	0	50000	0	5000	0	30000	40000	0	0	0	0	30000	155000
25	Ramanagar	75000	1500	0	0	0	7000	0	0	4000	0	0	4000	2500	0	94000
26	Shimoga	0	55000	0	0	20000	0	0	0	0	0	0	0	0	0	75000
27	Tumkur	184000	20000	0	0	0	151000	0	0	23000	12000	0	13500	3500	0	407000
28	U.Kannada	0	4000	0	0	69000	0	0	0	0	0	0	0	0	2500	75500
29	Udupi	0	0	0	0	45000	0	0	0	0	0	0	0	0	0	45000
30	Yadgir	0	0	0	19000	0	2500	0	22000	59000	33000	0	0	0	0	135500
	Total	722500	885500	180500	236500	317500	640000	200000	222500	755000	337500	114000	62000	57500	269000	5000000

Bhoochetana : 2012 district-wise irrigated paddy and sugarcane area in hectares		
District	Paddy	Sugarcane
Bagalkot	0	25000
Belgaum	3500	37000
Bellary	50000	0
Bidar	0	10000
Bijapur	0	6000
Chamrajnagar	8000	2000
Chickmaglur	5000	0
Davangere	55000	2000
Yadgir	25000	0
Gulbarga	0	3000
Hassan	20000	1000
Haveri	9000	0
Koppal	25000	0
Mandya	40000	10000
Mysore	55000	3000
Raichur	59500	0
Shimoga	40000	1000
Tumkur	5000	0
Total	400000	100000

Bhoochetana district-wise, *kharif* action plan 2012

Sl.No.	Districts	Área (ha)	No. of *taluks*	No of villages	Farmer facilitators	Lead farmers	FFS	Wall writing	No.of godowns	Vehicle transport	Gypsum @100 kg ha^{-1} (Tns)	$ZnSO_4$ @ 5 kg ha^{-1} (Tns)	Borax @ 2 kg ha^{-1} (Tns)
1	Bagalkot	97500	6	500	195	975	18	536	72	18	9750	488	195
2	Bangalore (R)	326000	4	922	652	3260	17	732	109	17	32600	1630	652
3	Bangalore (U)	204000	4	295	408	2040	17	328	48	17	20400	1020	408
4	Belgaum	292000	10	1250	584	2920	35	1500	250	35	29200	1460	584
5	Bellary	298000	7	408	596	2980	27	300	81.6	27	29800	1490	596
6	Bidar	54000	5	599	108	540	30	480	119.8	30	5400	270	108
7	Bijapur	20000	5	430	40	200	18	276	86	18	2000	100	40
8	Chamaraj nagar	112000	4	400	224	1120	16	400	80	16	11200	560	224
9	Chickballapur	125500	6	1419	251	1255	26	120	249	26	12550	628	251
10	Chikka magalur	129500	7	980	259	1295	34	433	225	34	12950	648	259
11	Chitradurga	285000	6	628	570	2850	22	0	125.6	22	28500	1425	570
12	D.Kannada	25000	5	406	50	250	17	0	81.2	17	2500	125	50
13	Davangere	227000	6	740	454	2270	24	740	148	24	22700	1135	454
14	Dharwad	153000	5	700	306	1530	14	720	306	14	15300	765	306
15	Gadag	180000	5	303	360	1800	11	144	64	11	18000	900	360
16	Gulbarga	484000	7	700	968	4840	32	300	140	32	48400	2420	968
17	Hassan	193000	8	1800	386	1930	38	1980	360	38	19300	965	386
18	Haveri	261000	7	683	522	2610	19	683	136.6	19	26100	1305	522
19	Kodagu	32500	3	251	65	325	16	386	50.2	16	3250	163	65
20	Kolar	87000	5	1082	174	870	27	280	216.4	27	8700	435	174

Bhoochetana district-wise, *kharif* action plan 2012

Sl.No.	Districts	Área (ha)	No. of *taluks*	No of villages	Farmer facilitators	Lead farmers	FFS	Wall writing	No.of godowns	Vehicle transport	Gypsum @100 kg ha^{-1} (Tns)	$ZnSO_4$@ 5 kg ha^{-1} (Tns)	Borax @ 2 kg ha^{-1} (Tns)
21	Koppal	160000	4	300	320	1600	20	300	60	20	16000	800	320
22	Mandya	72000	7	1417	144	720	31	2374	244	31	7200	360	144
23	Mysore	195000	7	1800	390	1950	33	2400	360	33	19500	975	390
24	Raichur	155000	5	700	310	1550	37	700	140	37	15500	775	310
25	Ramanagar	94000	4	823	188	940	18	1194	164.6	18	9400	470	188
26	Shimoga	75000	7	618	150	750	40	372	123.6	40	7500	375	150
27	Tumkur	407000	10	4000	814	4070	50	4000	800	50	40700	2035	814
28	U.Kannada	75500	11	1000	151	755	35	1400	200	35	7550	378	151
29	Udupi	45000	3	300	90	450	9	500	60	9	4500	225	90
30	Yadgiri	135500	3	300	271	1355	16	180	60	16	13550	677.5	271
	Total	5000000	176	25754	10000	50000	747	23758	5160.6	747	500000	25000	10000

Dharwad District Action Plan for the Year 2012–13

Project Implementation Schedule	
Activities	Schedule
District and *taluk* level workshop/training	28.02.2012 to 20.03.2012
Village selection	1.03.2012 to 05.03.2012
Farmer facilitator selection	15.02.2012t to 27.02.2012
Farmer facilitator training	21.03.2012 to 15.04.2012
Farmer registration	21.04.2012 to 10.05.2012
Village level training	01.05.2012 to 10.05.2012
Inputs distribution in cluster villages	11.05.2012 onwards

Soil Fertility Status

Soil test based nutrient availability status of district						
Taluk	OC%	Available Phophorus (ppm)	Available Potash (ppm)	Available Sulphur (ppm)	Available Zinc (ppm)	Available Boron (ppm)
Dharwad	Medium	Medium	High	Low	Low	High

Soil Health Status: Per cent farmers' fields deficient in nutrients

	Percent deficiency					
Taluk	OC%	Available Phophorus (ppm)	Available Potash (ppm)	Available Sulphur (ppm)	Available Zinc (ppm)	Available Boron (ppm)
Dharwad	6	34	1	65	27	47
Hubli	18	56	4	83	36	50
Kalghatgi	15	52	0	62	15	72
Kundagola	63	55	1	94	69	12
Navalgunda	71	74	0	89	80	6
District average	31	53	1	79	44	39

Cropwise Recommendations (kg ha^{-1})

Crop	*Taluk*	Urea	DAP	Potash	Gypsum	"Zinc Sulphate"	Borax
Paddy	Dharwad	100	50	50	200	10	2.5
	Kalghatgi	100	62.5	50	200	10	5
Hybrid Jowar	Dharwad	100	50	25	200	10	2.5
	Hubli	100	62.5	25	200	10	2.5
	Kalghatgi	100	62.5	25	200	10	5
	Kundagola	125	62.5	25	200	15	2.5
	Navalgunda	125	62.5	25	200	15	2.5
Groundnut	Dharwad	25	50	25	200	10	2.5
	Hubli	25	62.5	25	200	10	2.5
	Kundagola	25	62.5	25	200	15	2.5
	Navalgunda	25	62.5	25	200	15	2.5
Soyabean	Dharwad	40	80	25	200	10	2.5
	Hubli	40	105	25	200	10	2.5
	Kalghatgi	40	105	25	200	10	5
	Kundagola	40	105	25	200	15	2.5
Green gram	Dharwad	12.5	25	0	200	10	2.5
	Hubli	12.5	25	0	200	10	2.5
	Kundagola	12.5	25	0	200	15	2.5
	Navalgunda	12.5	25	0	200	15	2.5
Hybrid Cotton	Dharwad	80	40	40	200	10	2.5
	Hubli	80	52.5	40	200	10	2.5
	Kalghatgi	80	52.5	40	200	10	5
	Kundagola	92.5	52.5	40	200	15	2.5
	Navalgunda	92.5	52.5	40	200	15	2.5

2012 *Kharif* Bhoochetana area coverage								Raita Samparka Kendra	Farm facilitator		No. of lead farmers	No. of villages		No of farm school.
Taluk	Hy. Jowar	Paddy	Groundnut	Soybean	Green gram	Hy. cotton	Total		Total	New entry		Tota	New entry	
Dharwad	9000	5000	8000	11000	9000	4000	46000	4	92	57	460			6
Hubli	7000	0	8000	8000	5000	2000	30000	3	60	32	300			5
Kalghatgi	6000	6000	0	12000	0	3000	27000	3	54	34	270			4
Kundagola	500	0	11000	2000	2500	10000	26000	2	52	32	260			5
Navalgunda	7500	0	3000	0	8500	5000	24000	2	48	31	240			4
Total	30000	11000	30000	33000	25000	24000	153000	14	306	186	1530			24

Note:Information on total/new villages will be finalised and furnished

Inputs Requirement

Taluk	Urea (tonnes)	DAP (tonnes)	Potash (tonnes)	Gypsum @ 50% (tonnes)	Zinc Sulphate @ 50% (tonnes)	Borax @ 50% (tonnes)	Biofertilizers (kg)	Biopesticides seed treatment (kg)	Plant protection chemicals for seed treatment (Lts)
Dharwad	3358	5142	1854	9200	460	115	92250	19240	680.05
Hubli	1444	4364	1094	6000	300	75	73250	13795	549.25
Kalghatgi	2356	4712	1453	5400	270	135	37500	12863	192.00
Kundagola	1698	3296	1232	5200	390	65	69625	10345	600.70
Navalgunda	2473	2459	772	4800	360	60	36125	4238	355.33
Total	11329	19973	6405	30600	1780	450	308750	60481	2377.33

Government of Karnataka
Department of Agriculture

Implementation of "Bhoochetana" Programme during *Kharif* 2012 - Guidelines

With a view to increase the standard of living of farmers and also to improve the economic condition of the farmers by enhancing the crop yields of drylands, the Government of Karnataka have formulated an innovative programme called "Bhoochetana" from the year 2009–10 upto 2012–13. This programme is being implemented in all the 30 districts of the state in an area of 50 lakh ha.

Objective of the Scheme

The main objective of the scheme is to enhance the yield level of major dryland crops upto to an extent of 20% over a period of four years by adopting better cultivation practices.

Salient Features of the Scheme

- Implementation of the scheme by the Department of Agriculture in coordination with ICRISAT, Hyderabad, Watershed Development Department and also the Universities of Agriculture Sciences.
- Recommendation of suitable soil nutrients to the farmers based on the soil test results and by congregating the fertilizers status information of *taluk* and districts.
- Priority to major dryland crops of selected districts
- Storage of agricultural inputs at villages/cluster villages and distribution to farmers at subsidy.
- Obtaining the services of Farmer Facilitators to provide technical information to farmers at village levels.
- Use of publicity media like wall writings, village meetings, trainings, field days, road shows, articles etc., to enlighten the farmers to adopt better technologies like use of balanced fertilizers based on soil tests results, use of improved varieties, soil water conservation, integrated pest management, etc.

Guidelines for Programme Implementation

1. Implementation of "Bhoochetana" programme in all the 30 districts based on district-wise targets and crop-wise details, which have been given as a separate booklet

2. Villages to be selected in such a way that the programmed area comes in a cluster.

3. One cluster village shall be identified among 4 to 5 villages. First preference is given to watershed area while selecting the project area. Identify the Bhoochetana area after obtaining the district watershed map.

4. Obtain the services of Farmer Facilitator to provide technologies to farmers at village level at the rate of one farmer facilitator for 500 hectares of an average for a maximum period of 120 to 160 days depending on the duration of the crop. An honorarium of Rs. 150 per day to be given to Farmer Facilitator. The services of Farmer Facilitators be obtained efficiently at the time of Farmers registration, time of sowing, crop harvesting etc, stage by stage over a period of 120–180 days. Malnad and coastal areas obtain the service one Farmer Facilitator for every 250 ha. An honorarium of Rs. 150 per day, be paid in this region for a maximum of 120 to 180 days based on the crop duration.

Selection of Farmer Facilitator

- shall be a local farmer.
- shall be interested in Agricultural activities with group forming efficiency. Preference be given to farmers who have already served as Farmer Facilitator or to farmers who have obtained training in agriculture related departments.

5. Along with each Farmer Facilitator select, 5 leader farmers and their services are obtained for 15 days at the time of sowing. An honorarium of Rs. 95 be paid to the farmer leader.

6. Registration of all the farmers of selected village be made according to the prescribed format, (Annexure-1). Complete all the registrations by end of April and provide serial number to all the farmers.

7. **Farmers Field School:** Implement one “Farmer Field School” for each Raitha Samparka Kendra in order to transfer production technology to farmers successfully. Grants have been provided for components implementation based on the guidelines of ISOPOM, component details are given in Annexure-2.

8. **Training / Workshop:** District level: Organise workshops of 2 days duration for coordinating departments at districts level/districts and *taluk* level officers of institutions and also scientists of Universities of Agriculture Sciences.

Components Details:

1. Daily allowance at Rs. 125 for each participant.

2. Travel allowance: Actual travel expenses for university scientists.

3. Honorarium: Rs. 300 for each subject matter specialists.

4. Training materials: Rs. 5000 (pen, books, LCD projector, auditorium expenses etc.)
5. Other expenses: Rs. 2000

- ***Taluk* Level:** Training/workshops of two days duration to be organised for co ordination departments of *taluk*, officers of institutions, scientists of university of Agriculture Sciences, for selected farmer facilitators.
- **Components Details:**
    1. Daily allowance at Rs. 125 for each participant.
    2. Travel allowance: Actual travel expenses for university scientists.
    3. Honorarium: Rs. 300 for each subject matter specialist.
    4. Training materials: Rs. 5000 (pen, books, LCD projector, auditorium expenses etc.)
    5. Other expenses: Rs. 2000

All the training programmes at districts and *taluk* level shall be monitored by ICRISAT.

Note: The workshops of "Bhoochetana" programme were organised from 06 to 08, Jan 2012 at ICRISAT, Hyderabad. Expenditure shall be met, as detailed above for organizing two days action plan workshops at district and *taluk* level for implementation of "Bhoochetana" programme during 2012–13.

- **Hobli level/*taluk* level:** Training programme *taluk* level be organised for all farmer facilitators, farmer leaders and progressive farmers.
- **Component Details**
    1. Daily allowance at Rs. 125 for each participant.
    2. Travel allowance: Actual travel expenses for university scientists.
    3. Honorarium: Rs. 300 for each subject matter specialists.
    4. Training materials: Rs. 5000 (pen, books, LCD projector, auditorium expenses etc.)
    5. Other expenses: Rs. 2000
- **Information Meetings for Farmers at Cluster Villages**

Arrange information meetings of farmers at cluster level. All the Farmer Facilitators and farmer leaders shall attend these meetings compulsorily. All the local active self help groups and progressive farmers are to be invited to these meetings. An amount of not exceeding Rs. 2000 for each meeting shall be spent on local expenses.

- **Institutional Training for Farmer Facilitators:**

Six days duration institutional foundation training shall be compulsorily organized for the newly selected Farmer Facilitators in the district agricultural training centres/ agricultural research stations.

The district Joint Directors of Agriculture shall complete all the training programmes well before the commencement of season, in consultation with the concerned Directors of extension of Universities of Agricultural Sciences.

The topics to be incorporated in the training of Farmer Facilitators are as follows:

- The objectives of “Bhoochetana” programme
- Crop-wise details of the districts
- Crop-wise nutrient, recommendation based on the soil test results
- Farmers registration
- Function and responsibilities of Farmer Facilitators
- Technologies of Bhoochetana programme
- Soil and water management practices
- Nutrient management
- Crop-wise nutrient recommendations
- Integrated pest/disease management
- Farmers field school. and Raitha Shakthi Groups
- Agriculture practices to be followed to enhance the production in drylands
- Types of crop harvest experiments
- **Training Component Details**

Sl.No	Details
1	Boarding changes at Rs. 150 per participant per day
2	Lodging charges at Rs. 25 per participant per day
3	Actual Travel expenses for participant
4	Training material cost at Rs. 100 per participant
5	Honorarium for resource person Rs. 350 per Resource person
6	Other expenditure (certificate and others) Rs. 5000 per training

- There is a provision to pay Rs. 150 per day for Farmer Facilitator excluding training cost during the period of training. The cost of this shall be met out of the grants provided under Farmer Facilitators expenses after the completion of the training.

- The cost of such training programmes shall be met out of the service changes of Raitha Samparka Kendra and the same may be reimbursed to Raitha Samparka Kendra accounts after the release of grants under “Bhoochetana” programme for the year 2012–13
- The cost of all the training programmes/workshops shall be met out of grants provided under the programmes of Krishi Ustav, ATMA, district agriculture training centres. Over and above expenses shall be met out of the grants provided under publicity and training component. University of Agricultural Sciences shall monitor all the training programmes at hobli and village level.
- Community based activities: In order to make the farmers to work in a team agriculture practices like community seed treatment, seed sowings, plants protection measures, community market etc, shall be encouraged.

Training programmes shall be organized minimum two times compulsorily (before the season and in the middle of the season) at all stages (districts, *taluk*, hobli and cluster village)

9. Publicity:

- In order to educate the farmers about the scheme publicity should be given through public address system.
- Publicity through posters, hand outs, publications in Newspapers, Doordarshan etc,
- Publicity through village level meetings
- Inorder to educate the farmers about the dryland techniques to be followed by the farmers, minimum of two wall writings shall be done, in each village coming under the scheme. Each wall writing shall be of 80 sq. ft. area. An amount of Rs. 2000 shall be paid for each wall writings. These shall be under taken in newly included villages excluding the villages where wall writings have done during the years 2009–10, 2010–11 and 2011–12.
- **Field Days:**
- One field day shall be organized at each hobli level. For such items a maximum of Rs. 5000 shall be met out of the Farmer field school component under Bhoochetana programme which is already under implementation or under the component field days of other schemes.
- One field day shall be organised in each *taluk*. A maximum amount of 25,000 shall be met out of the grants provided under “Publicity and Training” component of Bhoochetana programme.
- Success stories shall be developed.

10. Soil Fertility and Nutrient Recommendations:

The handouts containing nutrient recommendations of major crops and also general fertility status of the *taluk* shall be given to all the farmers coming under "Bhoochetana" Programme. The expenditure shall be met out of grants provided under "Publicity and Training" of Bhoochetana Programme.

11. Stock/Distribution of Agriculture Inputs:

- The agriculture inputs like, seeds, micronutrients, biofertilizers, plant protection chemicals and also other inputs shall be, pooled and distributed to farmers at subsidy
- The amount provided under the scheme shall be utilized for all the inputs. Any subsidy shall be utilized according to the existing schemes of Department of Agriculture.
- In case of shortage of funds in other programmes of Department of Agriculture, indents of plant protection chemicals based on the pests and diseases of corps shall be placed under Bhoochetana programme after obtaining approval of the head office.
- The indent of biofertilizers, Biopesticides shall be restricted to the amount released for advance stocking under head of account of Bhoochetana programme.
- Suitable action shall be taken by the *taluk* Assistant Directors of Agriculture and district Joint Directors of Agriculture to maintain input wise accounts systematically with regard to receipt and distribution of all the inputs programmed to be distributed under the Bhoochetana scheme.
- Inputs shall be stocked and distributed to the farmers at cluster village level. In order to stock the inputs in advance at, cluster village level godowns can be hired at a maximum of Rs. 1,000 per month for a maximum of six months.
- **Vehicle facilities for transport of inputs:** In order to transport inputs from us Raitha Samparka Kendra to cluster villages an amount of Rs. 10,000 per RSK per season shall be utilized.

12. Conduct of Crop-cutting Experiments for Yield Estimate:

- Crop cutting experiments shall be conducted in co ordination with ICRISAT and University of Agriculture Sciences as per the guidelines of ICRISAT.

To take up crop cutting experiments in coordination with Directorate of Economics and Statistics:

- In case, the village and crop of Bhoochetana programme tallies with that of village and crop of the Directorate of Economics Statistics, then depute the Farmer Facilitators to such villages and crop to work as co- worker along with the basic worker of Directorate of Economics & Statistics to for crop-cutting experiments.

- In this regard, a meeting shall be organised along with the officers of Directorate of Economics & Statistics at district, to identify the village and crop which tallies. Suitable training programmes shall be organised for the farmer facilitators to enable them to conduct crop cutting experiments.

Duties and Responsibilities of the Scheme Implementing Officers

1. District Joint Directors of Agriculture/Watershed Development Officers:

Formulation of action plans, coordination, guidance and supervision with other departments, publicity and collection of data, verification and compilation. Deciding the technologies to be adopted, timely verification and reporting. Arranging inputs & required inputs.

2. Guiding Officers of Head Office:

Programme implementation monitoring, monitoring of efficient utilization of funds, monitoring of stocking of inputs and maintenance of records, coordination with district offices.

3. *Taluk* Coordinating Officers:

Deputy Directors of Agriculture of District Agricultural Training Centres, Assistant Directors of Agriculture shall work as coordinating officers to *taluk* Assistant Directors of Agriculture. Guidance for scheme implementation, monitoring and also reporting are the main duties of these officers.

4. Assistant Director of Agriculture (*Taluk*):

Assistant Director of Agriculture is the Head of the programme implementation; coordination with different departments of *taluk* and with the Krishi Vignana Kendras. Verification of selected villages. Inputs management preparation of action plans (dates of training programmes, time table of different activities etc,). Selection of staff for programme implementation, monitoring of publicity and records, distribution of grants, selection and approval of Farmer Facilitators, work verification of Farmer Facilitators, distribution of area of programme implementation to the staff, arranging of field visits.

5. Agricultural Officer (Raitha Samparka Kendra):

Preparation of action plan of Raita Samparka Kendra, arranging for supply of seeds to villages from the Raitha Samparka Kendras, monitoring survey, guidance, records, preparation of matter for wall writings in consultation with Assistant Director of Agriculture, publicity in hobli jurisdiction to conduct crop estimation and reporting to the Assistant Director of Agriculture. Arranging field days and field visits, arranging training programmes at Raitha Samparka Kendra level. Identifying technical hurdles, verification of budget, coordination with other institutions for loan facility, monitoring

of crop-cutting experiments and weekly review of progress of Farmer Facilitators and submission of reports to the Assistant Director of Agriculture.

6. Assistant Agricultural Officer/Agricultural Assistants:

Selection of area of scheme implementation and farmers, providing information to the farmers, attention shall be given to activities like, sowing to marketing. Identification of places for storage of inputs at village level, identification of Farmer Facilitators, identification of suitable places for wall writings, estimation of requirement of inputs at village level, introductory training to farmers and Farmer Facilitators, conducting crop cutting experiments.

7. Farmer Facilitators:

To work as link worker between farmer and extension staff, farmers selection and encouragement to farmers, to assist for primary survey, organise village level meetings, compilation of information in local resources, providing agriculture related information to the farmers, submission of weekly progress reports to officers of Raitha Samparka Kendras, One village level meetings shall be organized at appropriate time under the guidance of department officers/ICRISAT scientists, selection of farmer leader, assistance/instruction on sowing activities shall be given to the farmers through them, other related activities.

8. Krishi Vignana Kendras:

Identification of the technologies, providing subject oriented training to extension workers and farmers, providing supporting extension literature, information in advance about seasonal conditions, occurrence of pests and diseases, market intelligence etc, some of the demonstration of the department shall be organized by KVKs, participating in field days.

9. District Technical Officer of ICRISAT:

The technical officer of ICRISAT shall ensure about the organization of training programmes at appropriate time in taluks, monitor the training programmes at hobli and cluster villages, provide information on crop-wise technology, compilation of progress every week and crop cutting experiments and shall be send to head office. Conduct of crop cutting experiments after selecting the plots of crop-cuttingexperiments and shall send the reports to the Joint Director of Agriculture. Mainly submit the documents of various stages of project implementation (crop condition, pests and disease incidence, photographs, success stories etc) to the Joint Director of Agriculture.

Bhoochetana in Irrigated Paddy and Sugarcane Crops:

Paddy

Paddy and sugarcane crops are important crops of irrigated area of Karnataka State. The share of paddy over total production is about 40%. The average yield of paddy

under irrigation is 30–33 q ha^{-1} and 20–23 qtls/hectare under rainfed conditions. But the production efficiency is 50–60 q ha^{-1} in existing varieties and 90–100 q ha^{-1} in Hybrids. Out of the total production of paddy in the State the share of irrigated area is about 80% when compared rainfed paddy, the chances of getting expected yield is more in irrigated paddy. Keeping this in mind, so as to increase the production in irrigated paddy to an extent of 30%, it has been programmed to implement Bhoochetana programme in the districts of Hassan, Shimoga, Mysore, Mandya, Raichhur, Bellary, Belgaum, Chamarajanagar, Chikkamagalur, Haveri, Yadgiri, Koppal, Tumkur and Davangere districts during 2012–12 in a total area of 4 lakh hectares.

Due to high cost of cultivation in the existing paddy cultivation, the use of machineries is at minimum, restricted use of high yielding hybrid varieties, shortage of agricultural labourers, shortage of extension workers to provide technology to farmers, unscientific use of irrigated water, deficiency of micro nutrients, inefficient weed management, and occurrence of pests and diseases due to unfavourable seasonal conditions are some of the main drawbacks in getting higher yields.

Sugarcane:

Sugarcane is an important commercial crop of the State. Sugarcane is being grown in an area of 4 lakh hectares annually with a production of 360 lakh tonnes. The average yield of the State is 89–94 t ha^{-1}. This yield is less than the average yield of neighbouring State Tamilnadu (Average yield 105–107 t ha^{-1}). Keeping this in mind, to increase the productivity by 30% the Bhoochetana scheme is being implemented in Belgaum, Bagalkote, Bijapur, Shimoga, Mandya, Mysore, Hassan, Davangere, Chamarajnagar, Gulbarga and Bidar districts during 2012–13 in an area of 1 lakh hectare.

Low production in sugarcane are due to non utilization of improved high yielding with high sugar content varieties which are disease resistant and transplanting of sugarcane with lower spacing and also non adoption of intercrops, unsuitable water use, problematic soils, non available of labour etc. Therefore, it has been programmed to increase the productivity by adopting the following technologies under the scheme.

- Soil fertility based recommendations are to be finalized in the technical committee at district consisting of Agriculture Department, ICRISAT, scientists of Universities of Agricultural Sciences and then conveyed to the farmers.
- **Farmer Facilitator:** In order to implement the production technologies successfully the services of farm facilitators shall be utilized.
- **Farmers Field School:** Implement the farmer's field school approach in order to educate the farmers about integrated crop production practices.

- **Integrated Nutrients and Pest Management:** Stock the required inputs available under various schemes at cluster level and distribute as per the guidelines to the farmers.
- Organise training programmes at *taluk* level.
- Formulate suitable action plan on stages of irrigation after discussing it in the district irrigation committee.
- Publicity for high yielding hybrid paddy.
- Encouragement for seed production and seed assistance.
- **Use of Paddy Transplanters:** Encourage the farmers by providing paddy transplanters through Custom Hiring Centres so as to enable them to take up machine transplanting
- Encourage for the use of high yielding, high sugar content, and disease resistant sugarcane varieties.
- Encourage single budded seed material in sugarcane.
- Make use of agricultural machines in sugarcane, encourage largely the harvesters at 50% subsidy.
- Transplant in wide spacing lines and practice inter cropping

Project Implement Guidelines:

1. Implement the Bhoochetana programme in selected districts as per the districts wise crop and area targets.

2. Collect and analyse the soil samples in the selected villages as per the interactions of soil health section of the Department of Agriculture.

Sl.No	Activities	Time Table
1	Selection of villages	March 15
2	Collection of soil samples	April 15
3	Soil sample analysis	May 30
4	Recommendation	June 10

3. In order to provide technology to the farmers at village level, utilize the services of one Farmer Facilitator for every 250 ha. for a maximum of 120–180 days depending on the duration of the crop. An amount of Rs. 150 per day shall be paid to the Farmer Facilitator. The Assistant Director of Agriculture shall issue identification cards to the Farmer Facilitator. The services of Farmer Facilitator shall be successfully utilized at the time of Farmers registration, sowing time, crop harvest etc, stage by stage over a period of 120–180 days.

4. Farmer's field School: To educate the farmers about integrated crop production system one Farmer's Field School shall be established for every 2000 ha. (The component wise expenditure shall be incurred as pee the guidelines under Agriculture Micro Managements Scheme).

5. Organize a training of two days duration to fifty farmers at *taluk* level.

6. The other implementing guidelines are as per the guidelines of Bhoochetana programme.

Annexure-1

Farmer's Registration Form

District : Taluk : Village:

Farmer/Cultivators Name: Father/Husband 's Name:

Survey No/ Epic No: Ration card No:

Soil type: Previous crop: Area:

Cultivation practices			
Sl.No.	Activities	Practice	Amount
1.	Sowing		
2	Weeding		
3.	Intercropping		
4.	Irrigation (If given)		
5.	Plant protection		
6.	Harvest		
7.	Drying		
8.	Yield		

Crops				
Crop practices	Farmer's own variety/ improved variety	Seeds (kg ha^{-1})	Amount (Rs ha^{-1})	Date of sowing

Fertilizer/compost		
Sl.No.	Sample	Quantity (kg ha^{-1})
1.	Urea	
2.	DAP	
3.	MOP	
4.	Compost/green manure/enriched compost/vermin-compost agri-gold	
5.	Complex fertilizer	
6.	Gypsum	
7.	Boron/Agribor	
8.	Copper sulphate	
9.	Others	

Technology followed during previous year (*Kharif* 2011)		
Sl.No.	Activity	
1.	Seed treatment	
2.	Soil treatment	
3.	Inter-crop - cropping system	
4.	Soil & water conservation i. Dead furrows	
5.	Varieties : Local/improved	
6.	Spacing/no.of plants	
7.	Plant protection measures	
8.	Inter-bund management	

Additional Resources and Income Activities		
Sl.No.	Allied activities	
1.	Vermicompost	
2.	Animal husbandry	
3.	Poultry	
4.	Sheep/goat rearing	
5.	Piggery	
6.	Sericulture	
7.	Others	

Farmer's Signature:

Census Officer's Signature:

Census Officer's Name:

Date:

Annexure-2

Details of component-wise amount under Farmers Field School of Bhoochetana programme.		
Sl.No.	Component	Amount in Rs.
1.	Input kits (for 30 farmers and 5 extension staff) Farmer Facilitators/ Farmer leaders at Rs. 150	5250.00
2.	Coffee/tea for 38 participants and 3 trainees (38+15+4)	7980.00
3.	Contingency expenditure (fuel and others)	1400.00
4.	Literature for participants (@ Rs.30 per participant) (30x35)	1050.00
5.	Demonstration inputs and other supplementary expenditure	2000.00
6.	Field days a. Coffee/tea (for 38 participants & 62 other farmers@ Rs. 15 per participant) b. Contingency expenditure	 1500.00 3500.00
	Total	22680.00

About ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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